$4.00 a Year 50c a Copy

VETERINARY MEDICINE

APRIL 1940

CONTENTS

MAR 18 1940

Equine Infectious Encephalomyelitis.....207
Anti-Rabies Vaccine?.....208
The A. M. A. on Rabies.....211
Biologic Warfare and the Veterinary Service.....212
Recent Materia Medica: I. Vitamin D.....213
The Suicide of Microbes.....222
Hyperphosphoremia and Hypocalcemia in Dairy Calves.226
An Infectious Encephalomyelitis of Cattle.....228
Hematoma in the Testicle of a Bull.....231
Practical Suggestions for the Dairy Practitioner.....232
Peganum Harmala, A Poisonous Plant in the Southwest.234
Starlings Injure Cattle.....235
Phenothiazine a Highly Adaptable Therapeutic Agent..236
Observations on Bang's Disease.....238
Some Quittors are Inoperable.....240
Sodium Iodide for Fistula of the Withers.....242
The Care of Instruments.....242
Cough Therapy.....244
Avoiding Vaccination Reactions.....245
Our Annual Pig Loss Is Too Great.....246
Pathology of Rickets in the Fowl.....248
Botulism in Chickens.....250
Fowl Cholera.....252
The Treatment of Mandibular Fractures in Dogs.....256
Congenital Serous Cyst in a Calf.....259
"The Distemper" as Taplin Saw It.....260
Abstracts.....265-267

Diseases of Fur Animals in Finland, 265; Infectious Rhinitis of Swine, 265; Meat Inspection in Germany, 265; Anaerobes in Bacteriological Meat Inspection, 266; Milk-Borne Staphylococcus Poisoning, 266; Syngamus Pneumonia in Birds, 267; Vitamin E Deficiency in Puppies, 267; Sodium Iodide for Actinomycosis, 267; Deterioration of Sheep Dip from Use, 267.

Book Reviews.....268

Practical Veterinary Pharmacology, Materia Medica and Therapeutics; Fleas of Eastern United States.

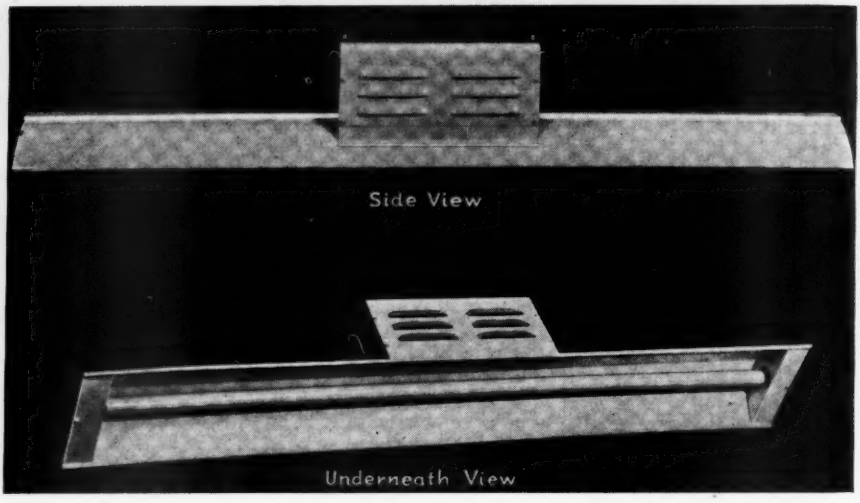
VOL. XXXV
No. 4

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

7632 S. Crandon Ave.
Chicago, U. S. A.

Operating Room Lighting

"Another Merillat-Laine fine surgical specialty"



This is the answer to your operating-room lighting problems. Glance over the following outstanding features.

1. **Economy. GUARANTEED to cut operating lighting bills more than 50%. Pays for itself in a short time on this feature alone.**
2. **"Cold" light; does not generate heat.**
3. **55 inches of daylight—no other lighting required.**
4. **NON-GLARE. No shadows. Any position of animal on your table will have full efficiency of the unit.**
5. **Does not give off a blue cast; eye strain, and eye fatigue eliminated.**
6. **Fine appearance, strongly built, and easy to install; just connect to existing outlet, and turn on the switch.**
7. **From spectroscopic analysis, daylight units are found to approach the efficiency of northern daylight.**

   Comes in two styles, one or two light units. For large rooms the two-light unit is recommended.

Model M-10 one lamp (as illustrated) . . . . . $37.50, express prepaid
Model M-12 two lamps (parallel) . . . . . 43.50, express prepaid

EXCLUSIVELY DISTRIBUTED TO THE PROFESSION

BY

Merillat-Laine Company, Inc.

1827 South Wabash Avenue **Chicago, Illinois**

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXV APRIL, 1940 No. 4

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year; per copy 50 cents; Special Issues $1.00

All matter appearing in this publication is copyrighted. No part of it may be reproduced without specific permission. Permission will be given if the purpose is unobjectionable. If there be any question as to the propriety of reproduction the author will be consulted.

D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
1265 Broadway, New York, N. Y.
Telephone Murray Hill 4-4037

COPYRIGHTED 1940 BY VETERINARY MAGAZINE CORPORATION

Los Angeles County, California, has two auction sales yards in which a large number of cattle and other live stock from seven states and Mexico were sold during the past year without disseminating any disease among the live stock of the county. These community sales operate under the supervision of the county veterinary service.

* * * *

Experimenting with rabbits, Remlinger and Bailly found that the virus of Aujeszky's disease is present almost invariably in the choroid of animals dying from the disease, but in only about half the cases in the retina. This is in contrast with rabies, in which exactly the reverse is true. The diseases are similar in that in neither case is the virus present in the aqueous humor.

* * * *

The question of the living or non-living nature of viruses is merely, according to Balozet, a matter of definition. Viruses have, in common with living matter, certain physical and chemical properties, the ability to reproduce, and the ability to adapt themselves and to undergo mutations. If these be accepted as proof of life, then viruses are living. If further requirements be added, then viruses are non-living.

The returns from fur farming in Wisconsin exceed those of tobacco, apples or cherries, products for which the state has long been famous.

* * * *

Twice the Wisconsin state legislature has considered bills which would have permitted cities to establish municipal milk plants as the sole agency for distributing milk within their limits. In 1935 such a bill passed the assembly but was defeated by a narrow margin in the senate, while in 1937 a similar bill was recommended for passage by the committeee on agriculture but lost when the legislature adjourned without taking action on it.

* * * *

In testing the food value of raw, pasteurized and evaporated milks, Anderson and Elvehjem of Wisconsin, fed it to a number of male and female dogs. All remained in excellent health and apparently thrived equally well on the different types of milk. However, puppies from females fed on evaporated milk developed muscular dystrophy at three to four weeks of age. Puppies from bitches fed raw and pasteurized milk, developed satisfactorily. The ailing puppies responded to supplements of synthetic vitamin E and also to wheat germ. They conclude from this that it is likely that evaporated milk is lower in vitamin E than raw or pasteurized milk.

Research workers in the University of Chicago reported to the American Association for the Advancement of Science at its recent meeting in Columbus, that zephiran may prove as effective against the organisms causing tooth decay as sulfanilamide is against certain strains of streptococci. Zephiran, in chemical terms alkyl dimethyl benzyl ammonium chloride, is a powerful germicide relatively harmless to mucous membranes and lowers the surface tension of water, thus its index of penetration is high. It prevents the growth of organisms in dental plaques which are believed to be associated with caries.

* * * *

Butterfat is a better food than coconut oil and other fats, even when the substitutes are "spiked" with extra vitamins such as butterfat contains, according to researches of F. J. Schantz, C. A. Elvehjem and E. B. Hart, of the University of Wisconsin. Repeated trials showed that experimental animals fed whole milk grew faster, looked better, got along on less food, and produced healthier litters of young than did animals getting skimmilk to which was added coconut oil, corn oil, soy bean oil, or cottonseed oil. In each case the milk was mineralized and supplemented with vitamins A, D, and E.

* * * *

The history of medicine is pathetically smirched with quackery. Purge and bleed; stimulate or starve; bake or refrigerate, were pompously advocated by succeeding apostles of Aesculapius. In the face of this, isn't it astounding that we still find an all important disciple of the art—perhaps a self styled specialist—who knows it all and is sure that the modest recommendations of the family physician and Grandmother's remedy for Johnny's cold are all poppycock? He looks wise, writes a prescription which is "just what Johnny needs" and still this man knows nothing more about the common cold than did Hippocrates, 400 years before Christ. The real physician should be regarded with warmth, not as an autocrat.—*J. F. DeVine.*

Dr. Walther F. Goebel, of the Hospital of the Rockefeller Institute for Medical Research, New York City, has developed a synthetic vaccine that protects rabbits and mice against Type II pneumonia. It is made of sugar and acids.

* * * *

Feinstone of the American Cyanamid Company reports that sulfanilamide, neoprotonsil, sulfapyridine and related remedies for streptococcic infections are more effective when given in oil than when administered in water or gum arabic in the usual manner. When given in oil the chemicals are absorbed more readily and the concentration in the patient's blood remains at a curative level for longer periods.

* * * *

Hospitals in the United States, in which mental diseases are treated, have on their books more than 500,000 patients, and more than 117,000 additional patients are in hospitals for mental defectives and epileptics. The incidence of mental disease in the age group over 65 years is ten times as high as in the age group under 19 years. By 1980 it is estimated the United States will contain half as many persons as now under 19 years of age and twice as many over 65 years of age. Unless material progress is made in the prevention and control of mental diseases, the number so afflicted in 1980 will thus be very large and the burden of caring for them enormous.—*S. N. L.*

* * * *

Eighty cases of gastroenteritis in the village of Frewsburg in Chautauqua County, N. Y., recently were traced to raw milk distributed by one dairy. All but three of the cases had their onset between November 4 and 14, and all were in persons who patronized the dairy or who had secondary infection from primary cases, according to *Health News.* It was found that a woman on one of the farms that had furnished milk to the dairy had suffered a similar disturbance with first symptoms November 1. She had not milked the cows but had washed the milk cans and pails.—*Jnl. A. M. A.*, 114:3.

In connection with the bovine brucellosis control project 40,000 blood samples were tested at the Storrs Agricultural Experiment Station during the year 1936-37. Of the 560 herds involved, 344 passed one or more tests under the federal eradication plan. The disease was eradicated quickly in 64% of the herds under control, by the removal of reactors to the first test. Reinfection in clean herds caused some trouble.

* * * *

The danger of producing off-flavored milk from cows eating weeds may be reduced by bringing the cows in from weedy pastures three to four hours before milking. Milk with an onion flavor, or with the flavor which results from cows eating French weed, is very offensive to the taste. Butter, cheese or evaporated milk made from such milk will retain this undesirable flavor.—*Wisc. Univ. Circ. 295.*

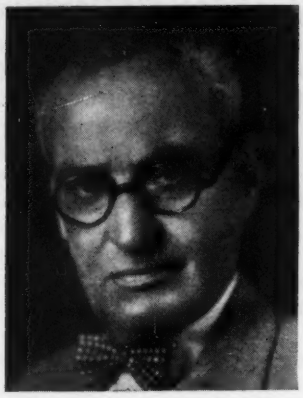
* * * *

Very good silage can be made from a mixture of clover and timothy, using 65 lbs. of molasses per ton as a preservative. On the average for the samples assayed, this silage contains more carotene than any other silage made during the year, according to research at the Wisconsin station. Feeding trials with dairy cows showed it also brought about the highest content of carotene and vitamin A in milk.

* * * *

It is principally lack of sufficient riboflavin, a vitamin, that prevents chicks from making fast growth on rations composed of grain and soy bean oil meal or other vegetable protein supplements. The fact that milk, fish, and meat products contain extra amounts of riboflavin largely explains why small additions of them markedly improve soy bean oil meal rations. From the standpoint of mixing economical practical rations, there is interest in the fact that using 3% or 4% of fish meal along with 12% or 13% soy bean oil meal in chick rations has given outstanding results. Sardine meal was the best of the fish meals used here, although menhaden and white fish meal also proved satisfactory.—*Wisc. Agr. Exp. Sta. Bull. 446.*

Doctor DeVine Dies at Sea



John Francis DeVine, 1874-1940

Almost at the hour of going to press comes word from Tahiti in the South Pacific that Dr. John F. DeVine died at sea near there March 3rd of a heart involvement consequent upon an attack of pneumonia; no further details.

John Francis DeVine was born June 5, 1874, at Rhinebeck, N. Y., and was graduated from the American Veterinary College in 1898. For a time he was assistant to Roscoe R. Bell and in 1902 he located in Goshen, N. Y., where he continued to reside until his death, and where he established a very large practice among the horses for which that locality is famous and in addition a cattle practice second to none anywhere. About 20 years ago he retired from general practice, but continued some of his consultation practice, which extended pretty much over the whole country.

Doctor DeVine was a prolific writer. More than 100 articles from his pen have been published in this magazine over the years.

Soon after the World War, Doctor DeVine established the DeVine Laboratories in Goshen, which he continued to operate until his death.

Doctor DeVine was a former Chief Veterinarian of the Department of Agriculture and Markets of New York (1909-11), a former secretary and president (1912) of the N. Y. V.M.A., a former president of the U. S. Live Stock Sanitary Association. He is survived by his widow, a daughter and two sons.

Health Exhibits Draw Crowds

The Medical and Public Health exhibits at the New York World's Fair, which were attended by 7,500,000 visitors in 1939, will be reopened for the 1940 season beginning May 11.

When the 1939 Fair opened it was estimated that 3,000,000 persons would view the health exhibits if the Fair's attendance totalled 40,000,000. The number of visitors to these exhibits, however, reached the unprecedented figure of 7,500,000 out of a total Fair attendance of 26,000,000. In other words, approximately one person out of every third visitor attended the Medicine and Public Health Building exhibits. This attendance has never been equalled by a similar exhibit anywhere, the nearest being that of the Hygiene Museum at Dresden in 1911, which had a total of 5,500,000.

The health exhibit at the Empire Exhibition, Glasgow, Scotland, 1938, occupied the only building that was crowded on the day that a party of American veterinarians visited the Exposition.

* * * *

Periodic ophthalmia is practically unknown in Montana.

* * * *

Is there any wonder that swine of today are subject to a variety of diseases? The modern hog, in comparison with its ancestors, has a diminished lung capacity, a limited capacity of the digestive tube, is maintained in filth, and is force-fed to make it marketable at six or seven months of age.

* * * *

Perhaps of all so-called iniquities that have ever assumed a sporting guise, the dog tracks are the worst. Almost everywhere throughout the Union they have been stamped out legislatively in response to outraged public opinion. But they muscled into Massachusetts as a "rider" to the enactment legalizing horse racing. The result has been inevitable; a combined web of crime and scandal has involved them; and when it has been thoroughly exposed to the light of day, it will be lucky for horse racing if it can escape serious besmirchment.—*Country Life.*

At the present moment as never before, it is imperative that racing purge itself of the corrupt, unclean and undesirable elements that have, like leeches and parasites, fastened themselves upon it.—*Country Life.*

* * * *

The New York City A. S. P. C. A. inspected nearly 2,000,000 cases in 1939, including 295,020 small animals housed or treated at the five shelters maintained in the city. In the society's hospital (Speyer) 58,494 days of hospitalization were provided, and 23,567 cases were handled in the clinic.

* * * *

Nothing should be put through a stomach tube until the tube has been distinctly palpated in the esophagus. A stomach tube can be felt most easily in the horse just posterior to the pharynx in the upper third of the esophagus. In the cow a stomach tube can be palpated most easily in the lower half of the esophageal groove.—*W. J. Gibbons.*

* * * *

The Almost Perfect Food

Modern scientific research has demonstrated that milk is the most nearly perfect food. But man did not wait for the endorsement of science to approve milk; the appreciation of its qualities is nearly as old as the race.

Buddha was a milk addict; it is said that he lived chiefly upon dairy products, and his opinion is recorded in one of the Suttas: "The cows are our friends; they give us food, also a good complexion and happiness." The physicians of ancient Greece prescribed milk for many diseases, and one commented: "To take milk is pleasant, to drink it is easy; it is also pleasing to the eye on account of its whiteness." Marco Polo tells in his writings of a stable of white mares kept especially to supply the Khan and his family with milk.

And so on, down through the ages, to Thomas A. Edison, who lived chiefly upon bread and milk during the latter part of his life, and who said of milk: "It is the only balanced ration—balanced by the great Chemist who is far away."

Equine Infectious Encephalomyelitis

In the annual report of the Chief of the federal Bureau of Animal Industry on the distribution, prevalence and mortality from encephalomyelitis in horses and mules for the past year, 8,008 cases are reported from 42 states with a mortality of 30%. This constituted only about 4% of the 184,662 cases reported in 1938. The mortality was slightly higher for the western type (26.7%) and slightly lower for the eastern type of the disease (89%) than in 1938. From eight states a total of 131 cases of "secondary" or "x" disease, which it is stated may be more appropriately termed "toxic hepatogenous icterus," were reported.

It is estimated that approximately three million animals were vaccinated with chick embryo vaccine. The incidence of the disease reported in vaccinated animals was 0.037%, and in unvaccinated animals 0.12%, in areas where the disease appeared. Since 9,462,305 doses of the vaccine were produced in licensed establishments it follows that much of it was not used. The reports on vaccination were very incomplete, only 806,575 of the estimated 3,000,000 vaccinations, or 27%, being reported. As the vast majority of the cases of encephalomyelitis were diagnosed clinically and since the infectious and toxic diseases are indistinguishable clinically, the latter was probably a factor in the reported incidence in both vaccinated and unvaccinated animals. In the unvaccinated it is not likely that the toxic type affected the percentage materially, but it may easily have been the type present in a majority of the 300 cases that occurred in vaccinated horses and mules. The Chief opines that vaccination was probably one of the major factors in reducing the incidence of the disease in 1939 96% as compared with 1938. He thinks the dryer season may also have been a factor by reducing the breeding of mosquitoes and that some increased resistance in animals exposed to infection in preceding outbreaks may possibly have been a factor in reducing the incidence last year.

A field test of a vaccine does not reflect its full value unless it be worthless. An effective vaccine protects the unvaccinated by interposing non-susceptible animals that hinder the progress of the infection. If a large proportion of the animals in a given area acquire an immunity only the most highly infectious and most readily disseminated disease can make any material progress because of the many breaks in the natural progression of the contagion.

Cases of untoward systemic reaction to the vaccine (local swelling, stiffness, abscess formation, anorexia, stupor, abortion, anaphylaxis and sometimes death) are stated to have been relatively few. However, unofficial clinical reports assess this factor as being far more important and a cause of concern at least to the owners in a considerable percentage of the light horses that were vaccinated. The Chief charges untoward systemic reactions to improper technique in administering the vaccine. Practitioners generally attribute them in part to the rather high percentage of formalin in the vaccine and in part to the large amount of tissue detritus suspended in it. In this latter opinion physicians who used the chick vaccine to some small extent in humans concur fully. Undoubtedly these untoward effects of the vaccination is one of the major factors in causing the hesitancy now apparent to carry out preseason vaccination again this year.

Most veterinarians think there will be much less preseason vaccination against encephalomyelitis this year than last; many horse and mule owners electing to wait till the disease appears near their communities before having their animals vaccinated. Many veterinarians are advising their clients to do so. Such was the advice of not a few last season, particularly in Missouri, where the state veterinarian adopted this course. The experience of Missouri has lent support to this plan, which is regarded as reasonably safe because of the extremely high efficiency of the vaccine and the promptness with which it affords protection against the disease.

Why Pick on Anti-Rabies Vaccine?

The report of Denison and Dowling[1] on the rabies situation in and around Birmingham, Ala., has been seized upon by those opposed to the vaccination of dogs for the prevention of rabies as a complete substantiation of their contention that the practice is futile and should be discontinued.

The report of Drs. Denison and Dowling is a fine piece of work. It is a good example of fact finding by extensive clinical observation rather than by more formal research where laboratory processes are involved and controls employed. However, the determination of the efficacy of anti-rabies vaccination in the dog was not an objective of the investigation, which was solely upon methods of control of rabies in man. Such information as was developed on the efficacy of anti-rabies vaccination in dogs was purely incidental to the main objective and on this feature the report leaves a good deal to be desired. The figures are far from complete as to the disease in dogs. This is definitely stated at one point in the report, and implied repeatedly. Complete figures, including cases clinically diagnosed but not confirmed by laboratory examination, might or might not alter the conclusion to be drawn from the report in the matter of efficacy of anti-rabies vaccine. Nevertheless, accepting the report as it stands, let's see just how inefficacious or otherwise it indicates anti-rabies vaccine to be.

Among 5,107 vaccinated dogs the incidence of rabies was 0.5%, and among 7,905 unvaccinated dogs the incidence was 1.35%, or nearly three times as great. The writers could determine no factor influencing the incidence of rabies in these two groups of dogs other than the vaccination of the smaller group. It is submitted that a good deal can be said for a means of disease control that lessens by 2/3 (in this case actually by seventeen twenty-sevenths) the number of cases. The discovery of a vaccine that would do this for common colds in the human would be hailed as economically the most important discovery ever made in medicine. A vaccine of this efficacy for human influenza would have saved 10,000,000 lives during the world-wide pandemic of 1918, and it is doubted that even the most rabid anti-vaccinationist would have had the hardihood to oppose it.

Much is made of the statement "Rabies vaccine is not 100% efficient." The statement is reiterated over and over. That is pommeling a straw man. No informed person ever said it was, or expected it to be, 100% efficient. One hundred per cent efficacy is not expected of any vaccine. Why demand perfection of rabies prophylaxis and at the same time unconditionally endorse prophylactic measures for other diseases that fall short of that goal? For example, take chick embryo vaccine for the prevention of equine encephalomyelitis. There has appeared in these pages within a few months the unequivocal endorsement of this vaccine by Schoening of the B. A. I. and the enthusiastic concurrence of Wayne Dinsmore. Their attitude undoubtedly represents the attitude of the veterinary profession and the horse industry respectively. Statistics submitted by Mohler (p. 207) amply justify this approval by all concerned. They show that in 806,575 vaccinated horses of which he was able to obtain a record in 1939, 0.037% acquired the disease. The incidence of disease in unvaccinated horses in the same areas was 0.12%—3¼ times as high. Thus, on a percentage basis, this completely satisfactory disease control measure was only 8% better than the anti-rabies vaccine which it is argued is completely useless.

Obviously, the comparative value of these two vaccines is not fully revealed by the foregoing comparison on a percentage basis. Just as certainly the Birmingham experience is the poorest showing so far made by anti-rabies vaccine in a field test. Quoting from memory, in Tulsa figures still more incomplete than those for Birmingham showed rabies 55 times as prevalent among

[1] *Journal of the American Medical Association*, 1939, 113:5. Abst. in *Vet. Med.* 34:11, Nov. 1939, p. 678.

non-vaccinated as among vaccinated dogs. The experiences of Detroit, of Kansas City, and of U. S. army posts fall between these extremes.

■ Those that oppose the use of anti-rabies vaccine under any and all conditions make much of what they allege to be unfavorable findings in laboratory tests under controlled conditions, citing the research of Barnes, Schoening, and the Rockefeller Research Foundation. Too much importance is attached to these findings. The researches of both Barnes and Schoening early in the history of anti-rabies vaccination in this country were with vaccines inferior to those now used. Both the manufacture and the administration of the vaccine have been improved materially as a result of investigations and experience. Nor were these tests entirely comparable to field conditions, since vaccine was tested against intraocular or subdural inoculation, neither of which is a natural mode of infection. For these reasons we may dismiss these investigations as not applying to present-day field conditions. They served a useful purpose in bringing about an improved product and better use of it, both changes being made to meet the very need shown by these tests. The fault lies not with the research but with the misuse of the report of it.

The Rockefeller rabies research which is being carried out at the Montgomery, Ala., laboratory of the Foundation is as yet incomplete, and statements as to what it will reveal are mere guesses. However, a recent test in two similar groups of 100 dogs each, one group vaccinated and the other not vaccinated, strikingly corroborates the observations of Denison and Dowling made at Birmingham, 100 miles distant, and presumably upon dogs having a similar degree of natural immunity to rabies. Following artificial inoculation with rabies virus, 60 of the non-vaccinated and 20 of the vaccinated dogs developed the disease; thus, as in the case of the naturally exposed dogs in Birmingham, the incidence of the disease was three times as high in non-vaccinated dogs as in those that had been vaccinated.

Everyone familiar with combating the sweep of epizootics recognizes the value of barricades of immune animals, or animals sufficiently resistant to escape the disease under natural conditions. Reducing the susceptibles by two-thirds will suppress most epizootics, transforming them into sporadic diseases where eradication becomes less difficult. This probably would not occur in the case of a disease so highly infectious as foot-and-mouth disease. It might not suppress hog cholera, but would come near it, particularly if supported by limited quarantine measures. It has been shown numberless times that such measures easily bring smallpox, diphtheria, and various other epidemics under control. In the case of a disease that spreads as slowly as rabies, it is reasonable to assume that a decrease of even 50% of the susceptible animals. (*i.e.* 50% of the susceptible dogs, since in this country they are, in the main, responsible for the spread of rabies) would easily rob it of its epizootic character.

■ In the final analysis, the advisability of the use of anti-rabies vaccine is not dependent upon whether it would control the disease if its use were universal. The present attitude of a large portion of dog owners is such that no measure of control can be fully enforced. No informed person questions that quarantine, if enforced as to all dogs, would completely eradicate rabies; but it can't be universally enforced in any considerable area. Effective muzzling, any means of preventing an infected dog from biting a susceptible one, will stop the spread and reasonably promptly eradicate the disease. Restraining dogs on leashes helps, and, of course, disposing of strays lessens the susceptible material and impedes the progress of the infection. Since, owing to the lawlessness of dog owners and the slipshod methods of disposal of strays, no one of these various measures for the control of rabies can be enforced, perhaps not to the extent of 50% over any considerable area; and since one dog owner will observe one restrictive measure and another will observe a different one (and not a few none at all), suppressing an outbreak of rabies is attained most promptly where all effective

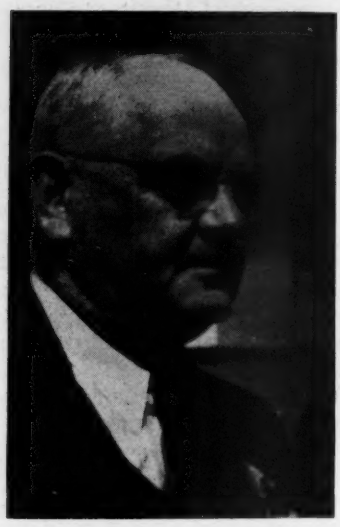
measures for its control are employed simultaneously. This has been the steadfast attitude of the veterinary profession, both of its members individually and of its national association. None have expressed entire satisfaction with the present vaccine. All hope for a better vaccine or for any measure which the dog-owning public will permit to eradicate the disease. Objection to the vaccine on the ground that it might generate a false sense of security in the minds of dog owners is pure persiflage.

■ From their actions one is sometimes forced to doubt that antivaccinationists are concerned about the control of the disease. The case of Indianapolis is fresh in memory. Rabies had long plagued the city authorities. In 1935 the dog heads examined and diagnosed as positive for rabies by the health department laboratories numbered 269. In 1936 a compulsory antirabies vaccination ordinance was enacted and the number of positive heads fell to 207. The ordinance met with much opposition from dog owners and the humane association; nevertheless, public sentiment approved it and the enforcement improved from year to year with a result that the number of positive heads fell to 166 in 1937; 98 in 1938, and 30 in 1939.

When this relatively low incidence of rabies was atained public interest waned and antivaccinationists were able to bring about the repeal of the ordinance providing for compulsory vaccination against rabies. At once those active in bringing about the repeal were lauded in dog and humane association publications; yet humane associations are presumed to have as one of their objectives the prevention of unnecessary suffering in animals!

Other methods used in conjunction with compulsory vaccination were no doubt in part responsible for the decrease of rabies in Indianapolis. Nevertheless, the fact remains that without vaccination the disease was increasing year by year, and with vaccination it decreased even more rapidly. The interest of the dog and of the public would seem to have dictated holding fast to vaccination, which is harmless, until something of equal or greater promise was available.

A NEW VETERINARY DEAN



DR. E. A. CROSSMAN

Edgar A. Crossman will become dean of the School of Veterinary Medicine of Middlesex University in June, when he retires from the Bureau of Animal Industry, U. S. Department of Agriculture, after forty years of service, according to an announcement recently made by the school. Doctor Crossman was born in Vanceboro, Maine, in 1870, educated in the public schools of Boston and Needham, and received the degree of Doctor of Veterinary Medicine from Harvard University in 1891. He entered the Bureau of Animal Industry in 1900. In 1918 he was appointed Inspector in Charge of Tuberculosis Eradication for New England. He attained the rank of Senior Veterinarian in 1928 and will reach the retirement age on May 21st this year. His leadership in the work of stamping out bovine tuberculosis in New England has brought him national recognition. He has been a regular attendant at A.V.M.A., U. S. Live Stock Sanitary Association and New England veterinary meetings, and in 1938 attended the International Veterinary Congress in Switzerland.

Doctor Crossman is president of the Eastern States Livestock Loss Prevention Association, past president of the Massachusetts Veterinary Medical Association, past president of the National Association of Bureau of Animal Industry Veterinarians, past president of the Boston United States Department of Agriculture Club, first vice president of the United States Live Stock Sanitary Association, and a member of the American Veterinary Medical Association, New Hampshire Veterinary Association, New England V. M. A., and Boston Medical Milk Commission.

He was formerly chairman of the Needham (Mass.) Board of Health and past president of the Needham Board of Trade. During the World War he was vice president of the Committee on Public Safety. He will occupy the position at the University of dean of the veterinary school and professor of veterinary medicine.

The A. M. A. on Rabies

The much advertised American Medical Association radio dramatization of the discovery and first employment of the Pasteur treatment for the prevention of rabies was broadcast February 21st.

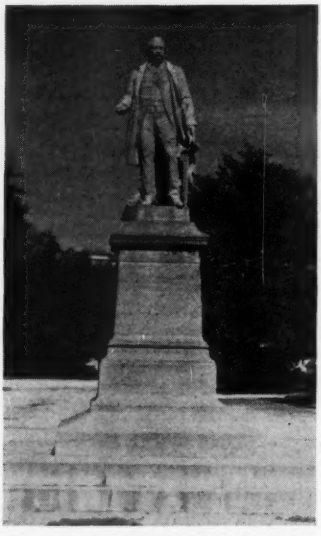
Joseph Meister

who as a boy was the first person to receive Pasteur's treatment for the prevention of rabies. The success of the treatment in this case (Joseph had been bitten 14 times by a rabid dog) brought immediate acceptance of Pasteur's method, which has been employed unchanged at the Pasteur Institute in Paris to the present time. Joseph Meister is concierge at the Institute. When "Louis Pasteur" was being filmed, Meister was made an attractive proposition to go to Hollywood and appear in the picture. He brushed this offer aside brusquely, pointing out that he could not possibly leave his post at the Institute—an attitude which recalls that of the Psalmist: "I had rather be a door-keeper in the house of my God than to dwell in the tents of wickedness." Meister is the only person now living who was in any way associated with the great Pasteur's discovery.

Doctor Bowers, introducing the drama for the medical association, stated that because of its prevalence in dogs rabies is a serious menace in some part of the country right now, and urgently requested all to cooperate with their public health officials to remedy the situation. Since he didn't explain what professional or legal qualifications public health officials had for undertaking the control of a disease in animals, we assumed that that would be indicated in the drama.

But the drama revealed that the discovery was made by Pasteur, a chemist, and that his chief adviser and supporter was Bouley, a veterinarian. Perhaps it was just as well the doctor's part was not portrayed, for the medical profession of France made Pasteur's life a nightmare by its opposition, and would have defeated him and perhaps driven him from public life but for the wholehearted and never-wavering support of the veterinary profession headed by the powerful Bouley, president of l'Académie des Sciences. But for the influence of Bouley, Pasteur's work would have had to wait many years for recognition.

The medical profession did not discover a way to prevent rabies nor recognize the value of the vaccine when it was discovered, but it knows just what to do about it now.



Henri Bouley

Pasteur's steadfast supporter, who was successively professor at the Alfort veterinary school (20 years), inspector general of the veterinary schools of France, member of the Academy of Medicine, commander of the Legion of Honor, professor of comparative pathology of the Museum of Natural History, and finally president of the highest court of science, l'Academie des Sciences at Paris—the highest honor that could be conferred upon a scientific man by his fellow scientists. This statue of Bouley, on the grounds of the national veterinary college at Alfort, was erected by a fund subscribed to by veterinarians from all over the world.

Biologic Warfare and the Veterinary Service

Parasites, literally defined, can destroy much of the plant and animal life required in the successful prosecution of war. But whether they can be intentionally implanted in such a way as to become a useful arm of offense is a debatable question among military scholars. One group contends that a biologic or microbic arm in the military service is not practical, another group fears its potentialities, and a third group declares that no one is justified in taking a positive stand on either side of the question in the light of present knowledge. There is general agreement, however, on two counts: (1) If victory can be thus achieved, the method will be used, and (2) the defense against such an arm must be as well organized as the offense and as well prepared.

Even though water supplies can be contaminated and virulent organisms might be sprayed over the enemy or dropped in flagons by airplane or implanted otherwise, Pfeiffer, Bordet and Madsen (League of Nations, 1924) contended that there is no danger in this because each of the known infections has its protective measures; whereupon Canon argued such measures were not generally available for mass protection.

In a review of the entire subject, Velu (*Rec. de Méd. Vét.*, Nov., 1935) declared that there *is* danger in microbic warfare and that neither international laws nor pacts will prevent its use. War is a violent state. It is outrageous. Belligerents are not governed by polity of peacetime fabrication. Diplomats poke their tongues into the cheek when they write international agreements of this sort. Such pacts are for peacetime consumption. More frankly, military men admit they will "stoop to conquer." Generals of France, Italy, Germany, Great Britain, and of this country are on record to that effect. All agree that no country deprives itself of effective weapons used by the enemy. Profoundly religious and ultra-polite Foch of World War fame is on record as saying, "When a people puts its entire force in a war, it is difficult not to use all arms, even though prohibited, if there is hope of victory in them."

On the German side one may quote Captain Meyer (*Volkszeitung*, Feb. 11, 1921), who declares: "The country that discovers the most virulent microbe for scattering over the enemy and that has the most effective vaccine to protect its own self, will be victorious." In 1918, Clemenceau (cited by Velu, 1935) cabled to the United States for Colorado potato bugs to scatter over the potato patches of Germany. MacDonald, former British premier, is quoted as saying that belligerents have the right to use any arm capable of bringing victory to them.

Rinderpest, foot-and-mouth disease, contagious pleuropneumonia of cattle, glanders, anthrax, hog cholera, brucelosis, psittacosis, tularemia and others are named in the category of animal diseases belonging to the microbic arm, and various plant parasites are pointed out as means of curtailing and corrupting food supplies.

In view of the bare facts, the possibilities of microbic warfare is so full of unknowns (Canon, 1924) that the science of bacteriology should not fall asleep under the anesthetic influence of fancied security.

Instances in which armies have been defeated and wars lost because of diseases among soldiers are familiar to every student of history. To deprive an army of sufficient food would hamstring it not less certainly than incapacitating it by infection; in fact, might lead to just that. Disorganization inescapable under the conditions obtaining in time of general mobilization might make their suppression difficult or impossible. Supported by a blockade, this might be decisive, and he is naive indeed who thinks this means would not be used if such were thought to be the case.

A Reuter message from Moscow at the beginning of the 1938 Russian "purge" stated that 11 persons had been sentenced to death for engaging in bacteriological warfare. They were accused of "systematic wrecking of agriculture by causing the death of 90,000 cattle."

Recent Materia Medica

By PROF. VICTOR LEWITUS
Nutley, New Jersey

IT is almost axiomatic that an animal's destiny depends upon the type of food eaten; but it has only recently been established that it depends likewise upon what is left out of the diet. The first intimation of these truths may be attributed to Lunin of Switzerland, who in 1880 noticed that mice died on synthetic diets because some factor present in natural milk was lacking. His conclusions were not considered important at that time, for medical men were busying themselves with the germ theory of disease. What these infinitesimal, yet indispensable, quantities of material were, Lunin did not know; but some years later the groundwork was laid by which isolation and synthesis of the "accessory food factors" (as Hopkins called them) occurred. As late as 1912, Funk called these vital substances "vitamines" thinking them to be nitrogenous derivatives or amines. At that time, postulation of "vitamine deficiencies" as the cause of disease was only in its infancy. Since then, great advances have been made. With the isolation and synthesis of many of the important members of the vitamin family, those inclined to be skeptical of their value have yielded more and more ground until today numerous animal dysfunctions have been either prevented or cured, thanks to the consistent progress that has been made in spite of the difficulties and discouragement which so often are a concomitant part of a new contribution to science. Here, as in other fields of science, real progress apparently came when the pure isolate could be demonstrated; but there is something unique about vitamins, as future discussions will show; that is, there is to some extent synergism or interdependence among the vitamins. Thus except under experimental conditions a pure deficiency of a single vitamin is not often encountered. Rather vitamin deficiencies as they occur in the field particularly if they have developed slowly are generally complicated by a deficiency of two to several of these accessory food factors.

I. Vitamin D

PERHAPS no other vitamin has been clothed in such a romantic background as vitamin D. It has been involved in a number of fast-moving episodes—animals developing rickets; cod-liver oil as a prophylactic; the discovery of vitamin D; the finding that sunlight has to do with vitamin production; the relationship between sunlight, green plants of the ocean, and fish-liver oil content; the conception of vitamin D formation in the skin by means of sunlight or ultraviolet rays; and eventually the application of irradiation to food processing. What an interesting array of events pertaining to the history of a single, but important vitamin!

History

It was in the year 1650 that Glisson first reported his observation of what we today recognize as rickets, but no real progress was made in the direction of therapeutic measures until over two hundred years later. It was Dr. Palm of England who, in 1890, as the result of painstaking researches observed that not all peoples suffered from the malady. After noting climatic conditions, and even making a careful study of Egyptian mummies, he rightly concluded that sunshine was a contributing factor. Before the turn of the century, it was he who advocated its use as a therapeutic measure. It was this very contribution, together with recognition of the value of fish-liver oils, which actually led to the discovery of vitamin D and its antirachitic power. It was in 1918 that Mellanby first recognized the presence of an antirachitic factor in cod-liver oil. McCollum (1922) was responsible for observing that some vitamin other than vitamin A accounted for the antirachitic action, and this he called vitamin D. Windaus, in 1932, was able to activate a sterol derived from

ergot (a fungus growing on rye) by means of irradiation with ultraviolet light, thus producing a substance called ergosterol or pro-vitamin D. Evidence at present points to the probability that other antirachitic factors than vitamin D occur in fish-liver oils and that ergosterol is not the sole pro-vitamin D.

Sources

Vitamin D occurs in the livers of fish (cod, halibut, tuna, herring, sharks, etc.), and to some extent in eggs, butter, milk, calves liver and sun-dried alfalfa. It is present artificially in viosterol (irradiated ergosterol), activated dehydrocholesterol (irradiated cholesterol), and irradiated foods, such as milk, yeast and grains. Another source is direct exposure to sunlight or ultraviolet light.

Vitamin D occurs in relatively few foodstuffs, though it has recently been developed in some by appropriate irradiation. It rarely, if ever, occurs in living plants. Dead plant tissue, through insolation, may acquire a certain degree of potency. Vitamin D is widespread in animals. It abounds in the fish kingdom. Though its origin in these animals is still obscure, it is thought to be synthesized by them. Higher animals lack the power to synthesize this vitamin, except as they are exposed to direct or indirect sunlight. For the most part, the animal must depend upon extraneous sources, e.g. food, for proper vitamin D intake. The ultimate origin of vitamin D, excepting in the case of fish, is traceable to sterols activated by ultraviolet light. It should be noted that direct irradiation of the animal body is interfered with because of (1) window-glass, which filters out important rays, (2) blankets, etc., (3) excessive exposure with some animals, (4) small proportion of ultraviolet rays at certain seasons, depending upon latitude, (5) atmospheric conditions (such as dust, smoke, etc.), (6), climatic conditions (cloudiness, humidity, etc.). Since Steenbock's discovery of artificial food irradiation, milk is being fortified as follows: (1) by direct exposure to ultraviolet rays, (2) by feeding standard irradiated yeast to milch cows, (3) by adding irradiated ergosterol directly to milk.

Irradiated yeast is the cheapest source for mammals, but for poultry it is not as effective as cod-liver oil. One teaspoonful of irradiated yeast per day was found by the Pennsylvania experiment station to supply sufficient vitamin D for 60 calves.

Chemistry

In line with other vitamin groups, it is probably more correct to refer to the vitamin D "complex" since there are at least six factors included in the group. Of greatest importance are two of these, vitamin D_2 and vitamin D_3. Vitamin D_2 is activated ergosterol, or viosterol, also known as calciferol. Vitamin D_3 is activated 7-dehydrocholesterol, also known as delsterol. The latter is activated animal pro-vitamin D, whereas the former is plant-activated material. Delsterol apparently is identical with natural animal vitamin D occurring in

The many readers who were enthusiastic about Prof. Lewitus' previous articles on drugs used in veterinary medicine will find this new series equally informative and stimulating. This series deals with two important phases of modern materia medica: the vitamins and the endocrine products. The large mass of experimental and clinical material available in these fields is summarized from the standpoint of practical clinical application. In some cases the practical application has already been worked out; in others, generalizations are made which point the way to the possibility of future uses of the product. In short, the purpose of this series of articles is to summarize in a practical way for the busy practitioner the enormous volume of complex data in the two newest fields of materia medica, which because of their increasing importance he cannot afford to ignore.

fish-liver oils. Vitamin D_3 has recently been shown by Waddell (1934) to be much more active in the case of chicks than vitamin D_2, but this difference has not been established in human beings or in certain other higher species. It has been found that, unit for unit, vitamin D_3 is practically as effective as cod-liver oil; and most authorities consider vitamin D_2 and D_3 as producing

Although the fish-liver oils are the richest source of vitamin D, the feeding of sun-cured hay, together with some exposure to direct sunlight, may supply enough of this vitamin to prevent the development of a D-deficiency in live stock.

equivalent effects on animals and humans. The formula for calciferol or viosterol (irradiated ergosterol) is $C_{28}H_{43}OH$. It is an oil-soluble substance, and is found in the natural state along with vitamin A in many instances. For the sake of clarity it should be pointed out that the form of vitamin D present in fish-liver oils is mainly irradiated cholesterol. Many foods obtained from animals, such as butter, milk and eggs, contain the "vegetable" vitamin D because these foodstuffs are synthesized partly as a result of the utilization of plant material, and animals apparently cannot convert one form of vitamin D into the other form.

Properties

It is a well known fact that vitamin D plays a definite part in the proper maintenance of the calcium-phosphorus ratio in the animal body. It has the power to restore to the bone matrix the enzyme phosphatase. This enzyme is capable of splitting organic or combined phosphorus, thus increasing the concentration of diffusible phosphorus to the point where calcium phosphate, $Ca3(PO4)_2$, is precipitated and bone thus formed. This mechanism is, of course, particularly important during pregnancy and lactation and during the early development of the young animal; but its value to the mature animal and during certain states of pathology must not be overlooked. Light effects and mineral metabolism will be discussed later.

Stability

Vitamin D is one of the most stable of the vitamins under ordinary conditions. Only under extreme conditions of heat and long exposure to light is it known to become unstable. However, its presence in many foods (such as milk, cereals, etc.) is so small in amount (unless such materials are irradiated artificially) that it must often be supplied to fortify the animal diet.

Assay or Standardization

Several techniques for quantitative determination of vitamin D potency in foods or other material are employed; for example, the bone ash method, in which chemical analysis of specific bones of experimental animals are made, thus estimating the degree of bone calcification, and hence the antirachitic potency of the substance under assay. Another method is that involving the x-ray; certain bones are exposed to roentgenography and comparison of the bone densities of various experimental animals serves as a basis for determining the degree of healing (or prophylaxis) of rickets. The third method, the one most widely employed, is known as the line test. Young rats are confined for 18 to 25 days to a rachitic diet. The rachitic animals are then divided into (1) negative control groups receiving no supplements to the rachitic ration; (2) positive control groups receiving graded doses of some standard reference material; and (3) assay groups given graded doses of the material being assayed. For the next eight days the last two groups are fed daily doses of the proper supplement, *i.e.* either the material being tested or the reference material. No supplement is fed on the 9th and 10th days. On the 11th day, the animals are sacrificed and either the proximal end of the tibia or the distal end of the radius or ulna is dissected out, sectioned, cleaned, and immersed in 2% silver

nitrate solution. By chemical reaction, the silver salts are deposited where calcium is present in the metaphysis of the bone. The cut surfaces of the bones are now exposed to strong light until the detail of cellular

City dogs do not commonly receive enough sunlight to supply their vitamin D requirements, and unless puppies are supplied the vitamin in their diet, they develop rickets. The better commercial dog-foods now contain vitamin D concentrates in sufficient amounts to prevent rickets and osteomalacia.

structure is very definitely developed in a manner similar to that of a photographic film. The light causes reduction of the silver salts, which form a dark line indicative of the extent of calcium deposition. The experienced technician can estimate the degree of healing from rickets by the continuity and area of the dark line. By comparing the results obtained with the three groups of animals, a quantitative expression of the potency of the material being tested may be obtained.

Recent work points to the value of a blood-phosphatase test which detects other forms of D-avitaminosis than that observed with rickets.

Function

Vitamin D serves the function of correcting defective calcium-phosphorus metabolism; preventing or healing rickets; treating spasmophilia (tetany); treating osteomalacia or osteoporosis; aiding in the formation and maintenance of proper bone and tooth structures. It is routinely used in greater quantities in the diets of young animals, or pregnant and lactating females. There are some indications that hypervitamin therapy is useful in certain arthritic conditions (see below). Because of its effect on mineral metabolism, vitamin D is also necessary for neuromuscular equilibrium.

Vitamin D, Mineral Metabolism, and Light

That vitamin D is absolutely essential for proper calcium and phosphorus utilization is an accepted fact.[1] It was in 1922 that Sherman and Pappenheimer first demonstrated that rickets could be produced or prevented at will by varying the ratio of calcium and phosphorus in the diet. For example, they found that a Ca:P ratio of 3:1 served as a prophylactic, whereas on a 6:1 ratio rickets ensued. It has been found that vitamin D is capable of producing calcification in spite of faulty calcium-phosphorus proportions; and normal bone may be formed with such supplementation. It has been observed that in rachitic animals the blood-calcium value changes little, but the blood-phosphorus values (inorganic form) decrease to about half normal. As has already been stated, the bone matrix contains an enzyme (phosphatase) which changes combined phosphate into a diffusible form of phosphate. In conditions such as rickets, the enzyme is found in rather large concentrations in the bloodstream, and for this reason is thought to "leak" into the plasma in the absence of vitamin D. That vitamin D reduces the loss of both calcium and phosphorus in the feces has been demonstrated by Harris. Thus it may be concluded that the vitamin affects absorption as well as utilization of the two elements. It must be pointed out in passing that excessive doses of vitamin D may result in hypercalcification, which makes vitamin D one that must be employed within a definite range of dosage for the respective species.

Regarding the question of light and vitamin D in relation to mineral metabolism, the recent work of Laurens has done much

[1] For a detailed discussion of calcium metabolism, see *Vet. Med.* 32:9, pp. 418-422.

Rachitis in a yearling boar. The painful joints which caused him to stand on his toes made walking difficult and interfered with his use for breeding.

to clarify this complicated field of research. Practically all attempts to show the effects of light on the growth of animals have ended negatively. It seems that animals grow as well in the dark as in the light if they are furnished with a complete diet. In respect to mineral metabolism, ultraviolet irradiation with wavelengths shorter than 3130 angstroms (especially 2967 units) exerts an influence on Ca:P metabolism even in the presence of an adequate diet. Of greater importance, however, is the action of ultraviolet radiation in rectifying a partial lack of components needed for bone and tooth calcification. Ultraviolet irradiation gives rise, from the provitamins in the skin, to vitamin D. Although it may prevent or cure rickets, promote growth, and prevent excessive loss of lime from the body, it apparently does not influence the healing of fractures. When animals are irradiated, the skin, liver, fat and muscles become antirachitically active. Ultraviolet radiation forms vitamin D either in the cells of the organism or in its foodstuff. The action of foodstuff artificially rendered antirachitic is qualitatively the same as the action of a naturally occurring foodstuff containing the antirachitic factor. The activation of foodstuffs such as milk depends on the same wave lengths that are effective in the cure and prevention of rickets. Vitamin D, in some way not yet understood, regulates the passage of calcium and phosphorus across the intestinal wall. It exerts its action by raising the blood calcium and/or phosphate. This is associated with an increased net absorption from the intestine, though under certain circumstances the bones may provide the calcium and the phosphate. The net retention of the animal as a whole is the resultant of two opposing factors: increased absorption from or diminished excretion to the intestine; and increased excretion on the part of the kidney. As the dose of the vitamin D is increased, the excretion by the kidney exceeds the intestinal effect.

Attempts have been made to show an interrelationship between the parathyroid glands and vitamin D; but the results obtained with irradiated ergosterol and parathyroid principles on the blood-phosphatase, on the urinary composition, and on the bones have been dissimilar. Parathyroid extract, though relieving the tetany associated with rickets, fails to induce healing in the rachitic metaphysis; in fact, it may actually retard it. Vitamin D, on the other hand, promotes calcification in the metaphysis and may even produce hypocalcemia and tetany unless sufficient amounts of calcium are furnished the animal. Any relationship that appears to exist between effects of vitamin D on calcium-poor diets and those produced by excess parathyroid hormone are without causal relationship; as is the opposite effect of excess vitamin D and parathyroidectomy on blood calcium levels.

Vitamin D fed to rickety animals increases the adsorbable fractions of calcium and phosphorus (total adsorbable). The diffusible, adsorbable calcium-phosphorus complex appears to provide the substance

for bone calcification. Parathyroid hormone, unlike vitamin D, increases the ion-containing fractions.

Practical Considerations

It is probably safe to state that outside of vitamin A, vitamin D is one of those most often lacking in the ration of live stock in this country. It is noteworthy that in the young animal and in pregnant or nursing females the presence of this vitamin in the diet assumes greatest importance. Even outside these two groups, however, it has been shown that the mature or adult animal must also be maintained on optimum levels of vitamin D intake, since otherwise there is an imbalance in the calcium-phosphorus ratio and as a result the skeletal structures are drawn upon in place of an external supply. For this reason it is best to consider that vitamin D is exceptionally important to all stages of animal development, rather than to underestimate its value because outright deficiencies cannot always be demonstrated as a result of incomplete supplementation of the diet. It is important to remember at this point that sunshine is considered a good substitute for vitamin D feeding, but if one considers the annual lack of sunshine to which the animal is subjected, be it a hen or silver fox or feeder lamb or calf, it is small wonder that such inadequate exposure has led to much D-avitaminosis. It is true that sun-cured roughage contains variable amounts of the pro-vitamin or vitamin, but since its presence depends so much on natural conditions (fluctuations in exposure to the ultraviolet portion of sunlight) it is doubtful whether it can be depended upon when deficiency conditions in the animal are manifest. One of the more reliable sources is grass silage, the popularity of which is well founded.

According to Marek and Wellmann, spontaneous D-avitaminosis in the form of rachitis, osteomalacia, and spasmophilia occurs in animals not as an obligatory but only as a conditional vitamin D deficiency disease, especially if the calcium-phosphorus supply is insufficient. From an etiological standpoint, therefore, an insufficient calcium and/or phosphorus supply plays the deciding role. Depending on the feeding characteristics and the metabolic peculiarities of a species, breed, or individual, the etiologically deciding factor is either absolute lack of calcium in the feed (as in carnivores) or absolute lack of phosphorus, which may occur in ruminants when, as is the case in certain regions, the roughage is very poor in phosphorus because of soil depletion. In swine, the most frequent etiological factor seems to be the predominance of phosphorus over calcium and magnesium compounds. In herbivora, loss of calcium may be brought about by an imbalance of sour feeding.

According to these same authorities, histologically rachitis in animals corresponds to the rare late rachitis in man on account of the greater osseous development in ani-

A side view of the tip-toe attitude of a rachitic boar.

mals at the critical period, and of the heavier load on the skeleton. Accordingly, the fibrosis of the medulla, the hasty formation of bones, and the osteoclastic destruction of bone in areas of strong mechanical usage characterize rickets in animals and do not justify the identification of this condition with osteodystrophia fibrosa. True fibrous osteodystrophy may develop, however, in conjunction with rickets, osteomalacia, and osteoporosis if, under the stimulus of an extraordinary mechanical load, medullary fibrosis, osteoclasia, and hasty bone construction become very extensive in degree and give rise to distention or deformation of certain bony parts.

Dogs have long been known to suffer from rickets and osteomalacia because of the common limitations of their diets as well as the frequency with which they are kept in confinement unexposed to the sunlight. Recent work by Sjoberg and others has definitely shown the curative effects of vitamin D administration in the presence of a disturbed Ca:P ratio. The requirement varies considerably in dogs, depending largely on breed; the larger and faster-growing types need proportionately more. The daily requirement of vitamin D is estimated at about eight U.S.P. XI units per kilogram of body weight. It is interesting to note the recent changes in dog-food formulae in which cod-liver oil and other vitamin D concentrates have been included where formerly they were absent. Even dog-biscuit is being fortified with certain concentrates. It should be pointed out that foxes are prone to rickets and poor skeletal development (narrow pelvis in vixen, with consequent loss of young), partly because of the priming of the coat which requires shade to maintain good color. Supplementation is very much in order in feeding these animals.

In the horse, according to Mitchell, an imbalance of the calcium:phosphorus ratio is evidenced in the form of an osteodystrophy (formerly referred to as osteomalacia, osteoporosis, and also bran disease). There are at times facial lesions, and in the early stages there is marked intermittent shifting lameness, often accompanied by spavin or ringbone formation, arthritis, neuritis, rheumatism, etc. The swelling of the mandible and facial bones, producing big head, is re-

This animal was fed a ration with an unbalanced calcium:phosphorus ratio. Following its death (of intestinal obstruction), autopsy revealed extensive erosions of the articular cartilages of the hip, shoulder and stifle joints; petechiae beneath the periosteum of the shafts of the long bones, with some blood spots in the bone marrow, and involvement to some extent of practically the whole skeleton.

garded as pathognomonic. In this country there is a more chronic form, there being more insidious types of lesions of the joints and bones without lameness, nerve trunk lesions, and ulcers of the stomach. The rarity of osteodystrophies in horses in Europe compared to its more frequent appearance here (though in another form) is probably due to differences in rations. European pastures and hay are rich in legumes, and the chief grain fed to horses is oats, a combination which has an optimum Ca:P ratio. In our own country, the variable quality of hay together with oats does not serve as an optimum diet. Grass-fed horses prove to be better; Porter's observation was that "among racehorses foaled in May you will not find a single roarer."

The importance of vitamin D to swine has been proved in a number of instances. Skelley, at the New Jersey Experiment Station, has shown just recently that pigs on a diet fully supplemented with vitamin D were not only free from rickets, but made marked gains in weight over shorter periods (196 pounds in 128 days on 568 pounds total feed per pig; controls gained 186 pounds in 165

days on 895 pounds total feed). Pigs under confined conditions without proper dietary supplementation will always be benefited by such vitamin provision. Johnson and Palmer, at the Minnesota Experiment Station, showed that pigs require vitamin D, though there are large variations as regards breed and individual requirements. It appears that white pigs are less apt to become rachitic than darker breeds. Low calcium or low vitamin D levels cause characteristic tetanic convulsions. Rachitic pigs, evidenced by low blood calcium, harsh hair coats, and unthrifty appearance, respond promptly to the use of irradiated yeast rations, even the appetite being favorably influenced. Darker breeds under exposure (subsequently confined) store protective amounts of vitamin D for only four to eight weeks, whereas the lighter breeds under identical conditions are protected for almost twice as long a period. Foot and Kon have recently shown that the continual addition of 0.5% cod-liver oil to the diet throughout the pig's life is adequate.

Sheep, like other live stock, require vitamin D in some form. A combination of sun-cured hay and exposure to sunlight is generally the most practical source. If lambs develop rickets, manifested by enlargements of the joints, the administration of cod-liver oil followed by the feeding of bone meal will usually serve to control the condition.

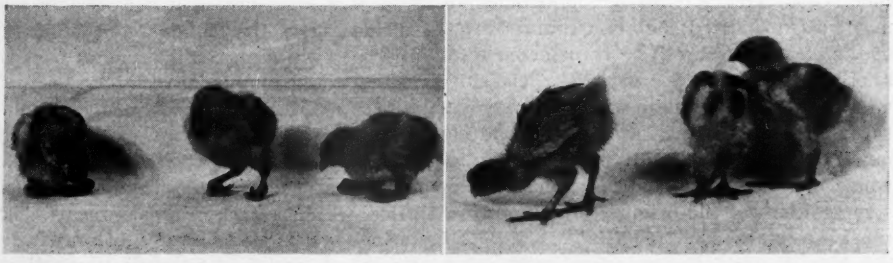
Although rickets appears more often in pigs and poultry than in other domesticated animals, attention has recently been directed to the occurrence of rickets and calcium tetany in calves under both practical and experimental conditions. At the Wisconsin, Pennsylvania, Michigan, and Illinois experiment stations it has been shown that unless vitamin D or exposure to ultraviolet rays are furnished the animal, rickets will result. It is probable that the feeding of sun-cured hay and some exposure to sunlight will serve as a preventive. In Pennsylvania rickets was pevented by feeding 2½ pounds of sun-cured alfalfa hay daily, whereas the same amount of machine-cured alfalfa did not serve as a prophylactic. It appears that the same conditions as regards vitamin D apply to sheep. Throughout Iowa and the northern states, according to Quin, cases of spasmophilia or tetany are commonly encountered in bucket-fed calves under confinement during winter and spring. At first the animals appear normal, but suddenly, on being fed, have a convulsive seizure, roll the eyes, and suffer dyspnea. They may recover, but unless treated for vitamin D deficiency, may die during a subsequent attack. The indicated medication is viosterol, fortified cod-liver oil, or other irradiated supplements. Hastings also has recently reported the symptoms and preventive measures for this condition. Although blame has been placed on other factors, it undoubtedly has been shown to be due to vitamin D or calcium-metabolism dysfunctions. He notes that calves confined to box stalls, gaining rapidly, suddenly show the first symptoms of calcium tetany in six to eight weeks. As a prophylactic he suggests some form of vitamin D; as emergency therapy, intravenous injections of calcium gluconate. Hastings is careful to point out that milk contains only five to 40 U.S.P. units vitamin D per quart, depending on the cow's feed. Winter milk is probably near the lower level. It has been estimated that a minimum of 300 U.S.P. vitamin D units per day per 100 pounds of weight is necessary to prevent rickets in calves. Thus, it can be seen why calves kept in barns and fed solely with milk are apt to develop such deficiency symptoms. An open pen and sun-cured hay at an early age will serve as a preventive measure; otherwise, a vitamin D supplement must be furnished: irradiated yeast, cod-liver oil, or other vitamin D concentrates. It should be noted that since a wide range exists between a normal condition and the stage at which clinical evidence of vitamin

D shortage becomes apparent, calves may suffer from subclinical or partial D-avitaminoses. Rations should be checked for mineral content, and should consist of four or five different varieties of plants; during the winter months a vitamin D supplement should be fed.

Deficiency of vitamin D in chickens and turkeys is generally readily recognized. The requirements of fowl are materially greater than those of other domesticated animals. The well-known symptoms of rickets in chicks, characterized by lameness, swelling of the joints and bone deformities, are part of the picture. Although laying hens will produce eggs for a time regardless of vitamin D stores, if vitamin D deficiency exists the calcium in the diet is not assimilated and the body calcium (bones) will be drawn upon in the formation of the eggs. In this way the hens will develop severe calcium deficiencies. Crooked breast bones appearing in good layers often result from a lack of essential vitamin D, or depletion of calcium supplies in the bones themselves. The estimated requirement for growing chicks in confined quarters is from 18 to 20 U.S.P. units of vitamin D per 100gm of feed. Laying hens require about 80 U.S.P. units. Turkeys require about 60 to 70 U.S.P. units per 100gm of feed.

Toxicity

Whether given in the form of cod-liver oil, other vitamin-D-containing fish-liver oils, concentrated synthetic products, or irradiated natural products, vitamin D is perhaps the only vitamin that has, thus far, been recognized as being toxic. Harris and Innes have indicated a condition of hypervitaminosis-D in dogs. Morgan, Hendricks and Shimotori have reported a similar condition in rats. Harris, Ross and Bunker, working on rats, have indicated that giving 50,000 units of irradiated ergosterol daily was more severe in producing calcification of certain tissues than 80,000 units of tuna-liver oil concentrate daily. They found certain detectable histologic changes in the kidney, stomach, heart, aorta, and lung. These portions of the body (in the rat) are more readily calcified than the liver, spleen and adrenal glands. The dose employed was 5000 times that necessary for therapeutic purposes in rats. In humans, excessive administration of vitamin D has produced such symptoms as anorexia, nausea, vomiting, abdominal cramps, diarrhea, frequent micturition. Less often, it causes tender gums and teeth, trigeminal neuralgia, dizziness, muscular pains and weakness, joint pains, headache, tingling or numbness of the extremities and loss of memory. There is usually a hypercalcemia of over 15 to 16mg per cent. Kidney pathology, sensitive colon, disproportionate calcium-phosphorus supply, and also of vitamins other than D, are indications for caution in vitamin D administration. Currently, certain workers have advocated the use of hypervitamin therapy in the treatment of certain forms of arthritis, rickets, tetany, etc., using massive doses (enormous single or daily doses) until effect. Whether or not this sort of therapy is rational remains to be seen.



In poultry as in other species, early treatment of nutritional deficiencies is essential if permanent damage is to be avoided. These two-weeks-old chicks recovered rapidly from their leg-weakness and other symptoms when fed a balanced diet. They are shown on the left before treatment; on the right, after being properly fed for five days.

The Border Between Life and Death

II. The Suicide of Microbes

By PROF. ALBERTO ASCOLI
New York City

WHEN microbes are carried in a stream of sewage, only the first few miles from the point of entry become polluted by them, because their bodies cannot stand the injurious properties of flowing water. If samples of the water be taken at increasing distances from the point where sewage entered the stream, fewer and fewer microorganisms are found, and at the end they are no longer detectable because they are broken up by a dissolving process that takes place within their own bodies. This dissolving process, bacteriolysis, can occur also *in vitro* if to a culture containing billions and billions of bacteria be added an appropriate substance, the bacteriophage, discovered by d'Herelle. This is used also as a therapeutic agent against infectious diseases caused by pathogenic bacteria. The phenomenon can be reproduced in a rather simple manner. Take a tube containing sterile broth; inoculate it with a bit of *Bacillus pestis* culture; put it in an incubator and let it become turbid by the multiplication of the inseminated microorganisms. Now put in an appropriate bacteriophage (for instance, a drop of serous fluid drawn from buboes of a recovered subject), and it will be seen that, when replaced in the incubator, the turbid quality disappears in few hours and the broth becomes clear as before. But the most remarkable fact is that the phenomenon may be transmitted; *i.e.*, if a minute drop of the cleared-up broth be transferred into another culture of *B. pestis*, the clearing effect takes place again, and this may be repeated a third and fourth time, and so on, indefinitely. It is quite impossible to conceive the phenomenon as coming from some content of the original liquid, and we must therefore conclude that, during the transfer, a dissolving principle must have been formed, or more exactly, regenerated. The question which then arises, is whether this regeneration necessitates the presence of a living being. The activity of the bacteriophage seems to manifest itself by the acceleration of processes of bacteriolysis like the one occurring in the flowing water. Bacteriophage acts as a "doping" agent, which causes the breaking-up process to take place in a short time, while the same process *in vitro* would take months, perhaps years. Bacteriophage (the latter part of the word is derived from *fagon*—eat), acts as a devourer of microbes, but it could not destroy such an enormous number of bacteria if the latter did not aid the work by furnishing the actual microbicidal substances from their own bodies. The phenomenon of the disappearance of microbes like the plague bacillus, seen when the broths of *B. pestis* clear, was actually known as the suicide of a culture in Haffkine's laboratory in India.

■ What does suicide of a microbe mean? Self-murder is in this case and perhaps in every case a shortening of the natural life span. No living being's life lasts forever, death comes sooner or later. One of human medicine's principal aims is to prevent curtailment of the life span granted to mankind. Suicide, or self-annihilation, on the contrary, is the voluntary shortening of this period. Suicide of a culture is a mass suicide, since the billions and billions of microbes which in the absence of bacteriophage would remain alive in the broth for weeks, months, or longer, are condemned to self-destruction as soon as the bacteriophage is introduced. By what means does this mass suicide take place? The Nobel prize winner, Jules Bordet, regards bacteriophage as a chemical substance which, when lysis occurs, causes the production of more bacteriophage. Bordet believes that the suicide factor comes from the injured bodies of the bacteria themselves, so that

a little bit of bacteriophage gives rise to almost any number of lethal doses. There are still a great many scientists who consider bacteriophage to be a living substance. They may be justified in thinking that it gives birth to offspring, generated by the original bacteriophage when it was introduced in the culture. Surely, one cannot help but admit that a regeneration of the suicide factor must take place; yet this regeneration may not necessarily involve the fission of the bacteriophage. Bordet is of the opinion that the suicide factor is a result of the disintegrating microbes themselves. This disintegration takes months and years under ordinary conditions, but it is accelerated in the flowing stream, and is realized immediately in the phenomenon called bacteriophagism. Does not this call to mind the process of catalysis? Catalysis means the acceleration of reactions which under natural conditions are so slow as to be imperceptible, just as we are unaware of the inexorable signs of oncoming death. Bacteriophage works then like a "dope" that regenerates itself. Its drugging effects are still operative after innumerable transfers, although, when such a weak stage of dilution is reached, no more of the original substance can be detected by chemical analysis. The phenomenon of bacteriophagism, because of its transmissible character, should therefore be classified among the autocatalytic processes, and the suicide factor of cultures finds quite a convincing explanation, if it is admitted that its eternal rejuvenation has its everlasting root in the disintegrating bacteria themselves. The suicide factor generated in these broken-down bodies is regenerated in every transfer, since it thrives upon the microbe bodies in the cultures. This theory presupposes that there is some constituent of the microbe which can be transformed readily into the suicide factor.

Another stand is taken by d'Herelle who, in his recent book, "Le Phénomène de la Guérison dans les Maladies Infectieuses," attributes to the bacteriophage phenomenon a primary role in the recovery from infectious diseases of men, domestic animals, and plants. He concedes that its first action is the destruction of microbes by dissolution, but claims the living nature of bacteriophage. In his mind, bacteriophagism is a contagious disease spread among microbes by a "protobios bacteriophagus," a living virus such as those described in a previous article.[1] His conviction as to its living nature is unshakeable. He does not comment upon the discussion which started since Stanley discovered the virus protein crystals in the mosaic disease of tobacco. While the plant viruses are of all viruses the ones whose behavior as a crystallizable nucleoprotein is most evident, this led us to believe that viruses might all be non-viable chemical substances. In d'Herelle's opinion the bacteriophage has been proved to be alive. But let us examine whether the proof stands up under a severe inquiry. In d'Herelle's opinion what are the criteria of life? Motility, respiration, growth, multiplication, assimilation, are properties shared by living beings with inert substances. Only the faculty of displaying a metabolism should be considered as an exclusive attribute of life. The bacteriophage is classified by d'Herelle among the living substances because of its ability to secrete enzymes. Since inert substances like zymogens yield enzymes to the surrounding media (sometimes, as in the case of trypsinogen, in series), this assumption is not convincing. One searches in vain in d'Herelle's book or elsewhere, for a conclusive answer to the question as to whether the bacteriophage is actually alive, or on the borderline of life, or, perhaps, confined to the realm of organic chemistry. It would be difficult to decide whether the death of microbes occurring in bacteriophagism is due to a disease by an infectious living microorganism, or to a suicide having its root in some perversion or disorder taking place in the fragmentation of their proteins.

■ Infectious diseases assail not only mankind and domestic animals, but also the lower forms of animal life. Apropos of this fact, it is interesting to recall that Pasteur

[1] Ascoli, A., 1940. The border between life and death. *Vet. Med.* 35:2, pp. 148-149.

started his famous career as microbiologist by the discovery of the pathogenic agent of an infectious disease of silkworms which was ravaging the silk industry in his country.

■ Even though it may sound strange, since we are more familiar with infections spreading in the higher animal and plant forms, it is not at all improbable that those microbes which are considered as the lowest vegetable forms, may be stricken by infectious diseases. Because of the minute size of the host, these etiological agents must be infinitesimal. Microbes have an average size of fractions of a micron, which is a thousandth part of a millimeter; but bacteriophages are measured in millimicrons (the millionth part of a millimeter). Neither the ultramicroscope nor the photomicrograph give available information on such structures, which resemble the almost colloidal granules of certain protein molecules, the size of which is but slightly less; the serum-globulin's diameter being estimated at 6.5 millimicrons.

Their size has been deduced by comparison with the size of the pores of porcelain filters through which they can pass, as well as by ultraviolet photomicrographs, or by ultracentrifugalization. Even the larger-sized viruses like those of psittacosis (250 millimicrons), agalactia of goats and sheep (150 millimicrons), bovine pleuropneumonia and vaccinia (150 millimicrons), rabies (125 millimicrons) might be considered either as very small living bacteria or as protein molecules, whose size (8 to 4 millimicrons) is extremely close to that of the virus of foot-and-mouth disease of cattle. So, on account of its filterability and confinement by ultracentrifugalization into certain strata, one can at least classify the bacteriophage among viruses. But are we not merely using a word to conceal our ignorance? As Goethe said:

"For just where fails the comprehension
A word steps promptly in as deputy."

Let us try to answer the question which again arises. Are viruses like those of psittacosis, agalactia, pleuropneumonia, foot-and-mouth disease, regenerated by means of autocatalysis? This would justify Haffkine's interpretation of bacteriophagism, observed by him in cultures of *Bacillus pestis*, as a suicide of microbes. Or are viruses living microorganisms of a smaller size than the microbes recognized as the cause of infectious diseases like diphtheria, pneumonia, and tuberculosis?

* * * *

Highly Efficient Disease Distribution

Community sales continue to increase in number. Some states now have more than a hundred such organizations. Notwithstanding their newness and the lack of experience of many who have gone into the business, as a whole, community sales have maintained the record established in the beginning of being the best low cost means of distributing disease among farm animals. Farmer vaccination and garbage feeding, two other abuses tolerated in this country alone, have been relegated to the positions of second and a bad third, although in the past both have made formidable records in spreading disease.

There seems to be much wishful thinking about a "Model Sales Barn Law," something that enforces itself. Then next year these same wishful thinkers would want some other law to control some new disease menace. "There ought to be a law" is a convenient alibi for inaction. Community sales require no unique measures for disease control. If the present live stock sanitary code in a given state is not adequate for the situation, and in most cases it is adequate if enforced, a new or amended code is needed. Piecemeal control, something special for each case, will never catch up. The control of animal disease is a responsibility of the veterinary service of a state. It doesn't have to be some special disease to entail that responsibility. A disease quarantine is just as applicable to equine influenza or hog cholera as it is to foot-and-mouth disease or rabies, where there is the will to employ it and where it is necessary to the welfare of the live stock industry.

NEW VETERINARY BUILDING AT COLORADO STATE COLLEGE DEDICATED

Dedication exercises for Colorado State College's new veterinary building were held February 20th, about 500 attending the program. Dean I. E. Newsom presided at the ceremony, and addresses were made by George H. Glover, Dean Emeritus of the school, who spoke on "The Veterinary School"; W. H. Feldman of the Mayo Foundation, "The Veterinarian in the Conquest of Human Disease"; and Cassius Way, New York, President of the A. V. M. A., "A. V. M. A. Progress, Past, Present and Future." The dedication exercises were held at the time of the college's fourth annual short course for veterinarians, held at Fort Collins, February 19-22, at which out-of-state speakers were Drs. C. W. Bower, Topeka, Kans., and J. N. Frost, Ithaca, N. Y., in addition to Doctors Way and Feldman.

Northeastern Breeders Favor Calfhood Vaccination

Broader plans for a Bang's control program in the North Atlantic States were advocated at a recent meeting of the Animal Health Committee of the American Society of Animal Production at Springfield, Mass.

The conference unanimously adopted the following resolutions:

"1. That whereas this group believes in the continuation of the present test and slaughter program for those who elect to follow it, we also recognize that due to various reasons, including its high cost to breeders and to the government, we appreciate its limitations, and advocate that careful consideration be given to putting into effect a supplementary control plan.

"2. That inasmuch as calfhood vaccination is proving a satisfactory and convenient means of Bang's control under practical herd conditions, providing protection against infection at the lowest cost to both the government and the breeder, we advocate that it be given official recognition by the Department of Agriculture of each of the North Atlantic states.

"3. (a) That a plan be established in each state for certifying or accrediting herds in which Bang's disease is under control, and in which calfhood vaccination is being systematically practiced under state supervision.

"(b) That it is recommended that all calves be vaccinated between the ages of 5 and 8 months.

"(c) That each animal as vaccinated shall be properly identified and reported to the state official in charge of this work.

"(d) That consideration be given to exempting from the official report of the blood test those vaccinated animals that are under 20 months of age.

"(e) That no vaccine shall be used or offered for sale unless approved by the proper state or federal official; all vaccine shall be applied by an approved veterinarian, who shall have a state permit to do this work.

"(f) That certificates of accreditation shall carry a statement that calfhood vaccination has been practiced in the herd, giving the date it was started.

"(g) That each state proceed to take steps to permit the entry of cattle from herds in other states that are so certified.

"(h) That uniform requirements for certifying herds containing vaccinated animals be adopted by all states.

"4. That nothing herein suggested shall be construed as being in any way opposed to any state-federal control program."—*Amer. Agriculturist.*

Hyperphosphoremia, Hypocalcemia

THE determination of the calcium and phosphorus content of the blood plasma of calves has served as a valuable aid in the diagnosis of deficiencies of calcium, phosphorus and vitamin D. A voluminous literature on these phases of nutritional investigations is available. For the most part in a deficiency of any one of the above named factors there is a decrease in either plasma inorganic phosphorus or calcium. With low vitamin D intake there is usually a decrease in both calcium and phosphorus. Gullickson and his associates[2] found both calcium and inorganic phosphorus decreased in a rickets-like disease occurring in calves fed rations low in calcium or vitamin D. Bechtel and his group[3] also reported low calcium and low inorganic phosphorus in the blood of rachitic calves. Wallis[4] has shown that mature cows fed a vitamin D deficient ration develop a syndrome not unlike that found in rickets in calves, which is also characterized by a lowering of both the calcium and inorganic phosphorus of the blood.

This report describes a rickets-like condition in calves which was characterized by a hyperphosphoremia and a hypocalcemia. The calves in a herd of pure bred Holstein cattle started showing symptoms of incoordination and evidence of pain in joints during the fall of 1933. Later bone deformations such as swelling of the joints and bowing of the backs were noticed.

The feeding regimen and management were as follows: The calves were turned out on timber blue grass pasture every day when weather permitted, except that a month might pass before very small calves were turned out. During the winter, the calves were out about two hours per day. They were fed whole milk for six months; during the first week, nine pounds per day, at two weeks, 15 pounds per day. For three months they received all they would clean up of the following grain mixture: 300 lbs. corn, 300 lbs. oats, 300 lbs. bran, and 100 lbs. oilmeal. Subsequently, the grain ration was changed to two pounds a day of a mixture comprising one part oats, one part bran, and one part oilmeal. Alfalfa hay was fed.

TABLE I.—Chemical Analysis of Calf Serum.

Date	11-29-33		12-30-33			2-5-34	
Animal Number	Mg. per cent P	Ca	P	Ca	Mg	P	Ca
1237	7.35	8.6	7.85	8.2	2.80		
1263	11.76	7.6					
1266	12.70	7.7	10.00	8.8	2.58		
1268	11.80	9.4	10.43	8.9	—	8.75	—
1269	12.00	—	9.15	10.0			
1270	12.00	8.2	10.00	—	—	8.66	—
1271	13.10	8.1	9.38	10.0	2.79	9.76	—
1273	13.30	6.5	10.00	8.9	—	9.35	—
1274	10.89	9.2	10.43	9.6	2.53	10.00	—
1275	12.75	7.5	10.34	8.9	—	—	—
1276	8.35	8.4	8.49	9.5	3.87	7.38	10.9
1277	12.50	8.6	10.81	9.8	2.63	11.28	10.5
1278	11.68	9.5	11.42	9.0	3.42	10.25	10.6
1279	10.95	9.3	11.01	10.0	2.53	—	—
1281	10.25	9.0	10.52	10.1	1.71	—	—
1282	9.75	9.1	10.61	8.2	—	8.65	10.2
1283	8.30	8.3	10.06	11.3	—	8.34	11.2
1284	8.40	7.7	10.68	10.0	3.46	10.15	10.3
1285	11.40	9.1	10.25	8.6	—	10.65	11.0
1286	10.00	7.8	9.64	8.6	—	9.09	11.6
1287	9.40	8.2	9.83	8.8	—	10.69	11.0
1288	9.75	7.4	8.89	9.3	—	10.82	11.2
1289	10.90	8.0	—	—	—	9.20	10.6

Analyses for serum calcium and inorganic phosphorus were made November 29, 1933; December 30, 1933; and February 2, 1934. On December 30th a few serum magnesium determinations were made also. These data are summarized in Table I. The decided tendency to high inorganic phosphorus with low calcium suggested a calcium deficiency as the etiology of the condition. Calcium carbonate was included in the feed after the results of the analysis of November 29th were available. No further cases of the condition have occurred and periodic analyses of the blood have shown normal values.

A heifer, No. 1237, and a bull were brought to the laboratory for further study. These animals were badly deformed. They were treated with cod-liver oil and ultraviolet irradiations, and fed a ration high in

[1] Now head of the Department of Bacteriology and Veterinary Science, University of Arkansas, Fayetteville, Ark.

[2] Gullickson, T. W., L. S. Palmer and W. L. Boyd, 1936. A rickets-like disease in young cattle. Tech. Bull. 105, Univ. of Minn. Agr. Exp. Sta.

[3] Bechtel, H. E., E. T. Hallman and C. W. Duncan, 1936. Pathology of Rickets in Dairy Calves. Tech. Bull. 150, Agr. Exp. Sta., Mich. State Coll.

[4] Wallis, G. C., 1938. Some effects of a vitamin D deficiency on mature dairy cows. *Jour. Dairy Science*, 21, p. 315.

in Dairy Calves

By D. F. EVELETH,[1] M. W. EVELETH and F. E. WALSH

Veterinary Research Institute and the Department of Veterinary Obstetrics Iowa State College, Ames, Iowa

calcium. The blood chemistry soon returned to normal, but the bone deformations did not improve. The bull was later used for a time as a sire and produced a few viable calves, although later he became permanently sterile. The heifer never conceived although bred to several bulls of known potency.

TABLE II. BREEDING RECORD (JUNE, 1939) OF FEMALES LISTED IN TABLE I.

1237	Never conceived	Sterile—killed
1266	2 vigorous calves, 1 premature	Sterile—killed Jan. 1936
1268	3 normal calves	Still in herd
1269	4 normal calves	Tuberculosis, May 1938
1270	Slaughtered April 1934	Tuberculosis
1271	3 normal calves	Still in herd
1273	3 normal calves	Still in herd
1275	1 normal calf	Defective udder, killed Nov. 1937
1278	3 calves (1 died)	Still in herd
1281	Killed June 1934	Bone deformation
1282	Killed April 1934	Bone deformation
1284	Killed Aug. 1937	Never conceived
1285	2 normal calves	Defective udder, killed Oct. 1938

These few cases of a rickets-like disease of calves showing high serum inorganic phosphorus with low calcium probably constitute an unusual condition. There was likely a concurrent calcium and vitamin D deficiency, but adjusting the calcium intake prevented further cases from developing. The sterility in the animals studied gives additional emphasis to the necessity of proper nutrition in dairy calves. Sterility in older animals frequently occurs in animals having histories of deficiency diseases as calves.

The breeding records of the females listed in Table II are rather discouraging to the dairyman. Two calves, Nos. 1281 and 1282, were slaughtered because of poor conformation, which may have been largely the effect of the disease. Three animals, Nos. 1237, 1266, and 1284, were either definitely sterile and failed to conceive at any time or became sterile later, as in the case of No. 1266. The removal of Nos. 1269 and 1270 because of tuberculosis and Nos. 1275 and 1285 because of defective udders leaves only four producing cows of the original 13 heifer calves. This percentage seems definitely low in a herd of registered cattle. The eradication of infectious diseases would in this case have materially increased the number of producing cows, but the loss of the animals from sterility and faulty conformation still would have been too high.

In this case a definite calcium and a probable vitamin D deficiency were present. The importance of these factors in maintaining the normal reproductive cycle has been stressed by Wallis.[4] The earlier workers have all pointed out the relationship of mineral metabolism to skeletal formation. It is also conceivable that calcium and vitamin D play a role in the normal development and functioning of the mammary gland and other organs of reproduction.

With low vitamin D intake there is usually a decrease in both calcium and phosphorus in the blood plasma. The authors observed calves presenting the clinical picture of rickets which was characterized by a decreased amount of calcium and increased phosphorus in the blood serum. Contrary to the usual history of rachitic calves these animals were not confined away from sunlight but were turned out to pasture every day. They had been fed a ration low in calcium and high in phosphorus. The condition was overcome promptly by feeding a ration high in calcium. However, the deformity resulting from bone involvement was not improved. More important still, upon reaching maturity the animals were sterile or unsatisfactory breeders; emphasizing again the necessity for proper nutrition of dairy animals during the period of calfhood as well as during lactation.

A Preliminary Report on an Infectious Encephalomyelitis of Cattle

By S. H. McNUTT, Ames, Iowa
Veterinary Research Institute
Iowa State College

A DISEASE of young cattle that closely resembles Listerella infection has been observed for the past several years in this region. It is primarily an infectious encephalitis and meningitis which has been observed only in young cattle. It presents certain features that have not been reported in listerellosis of cattle, although all its recognized lesions have been duplicated in listerellosis of species other than cattle. Extensive efforts to isolate Listerella from cases of the disease have met with failure in every instance. It is designated here merely as an encephalomyelitis, since its cause has not yet been discovered. The records of the disease in this laboratory are kept under the title of "Buss encephalitis" because it was from a herd of cattle belonging to a Mr. Buss that satisfactory experimental material was first furnished, and this temporary designation is used in this paper. For the sake of convenience, the infective agent is referred to as a virus, but it must be understood that this does not necessarily mean that it is a filterable virus, since this has not been determined.

Very little is known of the incidence of Buss encephalitis, although it has been definitely recognized in four herds within a radius of 75 miles. A brief history of the affected herds follows:

In the first infected herd, all cattle had been raised on the farm. One heifer became sick suddenly, followed in a short time by a second. The main symptoms were inactivity and a high temperature. Both animals became worse rapidly and died about a week after first showing symptoms. Examination of one of these animals showed an encephalitis and a fibrinous peritonitis. No more trouble has been experienced on this farm.

On the second farm, 12 calves three months of age and under had been purchased and kept together away from other cattle. These sickened one after another until seven had died in a period of about two weeks. The eighth animal was brought to the laboratory in the late stages of the disease. Examination showed an encephalitis, fibrinous peritonitis, and calf scours. Examination of the remaining calves showed them to be in poor condition because of a recent illness, but they were nearly recovered and it was suggested that the owner sell them for slaughter as soon as they had regained flesh. This advice was followed, and no more trouble has been experienced.

On a third farm, two heifers sickened. One of these was in milk and because the owner did not wish to use such milk, it was fed to two calves. The two calves sickened about two weeks later. Examination of one calf showed that it was affected with encephalitis. After an illness of two or three weeks, the two heifers and the remaining calf gradually recovered from the acute condition, but the heifers were left with certain enlarged articulations, in a poor, crippled condition. Material from this case inoculated into susceptible animals reproduced the disease and it has been carried in series in such animals for the past several months—a proof that the disease is a single specific entity.

On the fourth farm, infected cattle were found about two months ago. There were several hundred head of cattle on these premises, so that opportunity was afforded to observe how the disease would behave in a large herd. Up to this time, the infected herds had been small and the disease disappeared quickly, but in this large herd, the disease still exists after two months, although restricted to one lot of calves. This owner purchased 80 whiteface calves out of a lot of 297. They weighed about 300 to 350 pounds each. They were and have been yarded with only fences separating them from milk cows and fat steers. About 25 to

30 days after purchase, a few of the 80 sickened with encephalitis. Since then, some 20 have sickened and 12 or 14 have died. Susceptible animals have been infected from these cases also.

■ Only a limited number of different species of animals have been inoculated with infective material from cases of the disease, and a study of its cause is far from complete. Both aerobic and anaerobic cultures on various media have remained sterile. Blood smears have been negative. A search for inclusion bodies has so far met with failure. A few filtration experiments have been completed and more are in progress, but are not ready for report. Guinea pigs immunized to the western strain of equine encephalomyelitis (the only type found in this region), are very susceptible to this infection, showing that it is not related to equine encephalomyelitis. Subcutaneous injections into swine and sheep produced no reaction, indicating that it is not a disease of these animals. Rabbits can be infected by intracranial and intraperitoneal injection. Guinea pigs are readily infected intracranially, subcutaneously or intraperitoneally. Other animals are being tested.

The brain, liver, spleen and sero-fibrinous exudates have been found to be infective. In three trials, blood of affected animals did not reproduce the disease. Some difficulty has been experienced in storing infective tissues. The virus remains alive for about 30 days in tissues stored at ice box temperature or frozen; thereafter, viability has been uncertain in both cases, but freezing seems to be preferable. Storage of infective tissues by some of the means employed for filterable viruses has been unsatisfactory. The causative agent seems to be easily killed.

In calves that have been injected subcutaneously with infectious material, the incubation period has been from seven to 27 days. Of 16 calves so infected, seven had an incubation period of seven days, five sickened in 14 to 16 days, and only one after 20 days. The first symptom is a temperature that rises from a normal of 103 or under to 104 to 107 in a few hours. The temperature is usually constantly high until near death or beginning recovery. A return to normal followed by a rise has been observed in only one animal; this was thought to be a relapse. It is a peculiar circumstance that in spite of a high temperature, the appetite remains good for sometimes as long as two days after the onset. Thus, at the beginning of the disease, animals appear well and may not be suspected unless temperatures are taken. However, the appetite gradually becomes poor and with the high temperature there is a moderately rapid loss of flesh which may continue even after the temperature subsides and the animals are on the way to recovery. That the major nervous symptom is a cerebral depression constitutes another peculiarity, and in this respect the disease is similar to malignant catarrhal fever. Excitability, blindness, marked incoordination, pushing against objects and turning have not been observed. There is no marked diarrhea or discharge from the eyes or nostrils. The course of the disease is from about five days to two weeks. About 60% of the affected animals die. Recovery can take place at any time and even animals that have been down a week sometimes recover.

Lesions of the brain, cord, liver and kidneys are almost identical with those seen in malignant catarrhal fever and in listerellosis. The cerebrum and the meninges of the cerebrum are especially apt to show lesions. No significant changes have been observed in the muscles, intestines or pancreas. If autopsies are performed on animals in the early stages of the disease, no gross lesions are observed. A little later, the serous cavities are affected. In the peritoneal cavity, a serous exudate develops, with a stringy network of fibrin, flattened, irregularly circular flakes of yellow cheesy exudate, sometimes several inches in diameter, and up to two gallons of straw-colored serous fluid. A condition similar, but less marked, is often noted in the pleural cavity. The pericardial sac may contain large amounts of serous fluid. The lymph nodes are enlarged.

When infective material is injected into

guinea pigs, the tendency is toward a more localized disease, and only the affected parts contain the virus. Thus, of 100 guinea pigs infected intraperitoneally, only two have had encephalitis. Brain tissue from infected guinea pigs not showing encephalitis does not contain the virus. Likewise, in guinea pigs infected intracranially, the abdominal organs do not ordinarily contain the virus. Guinea pigs that have recovered from one attack are resistant to a second injection. A second attack has not been noted in cattle. Apparantly, there is some immunity following one attack, but observations to date indicate that this is not very solid.

■ A diagnosis is made on a consideration of the symptoms, course and duration of the disease and, where possible, on autopsy findings. Those diseases and toxemias that result in death within two days are immediately eliminated, and also those in which the temperature is not persistently high or in which there is no elevation of temperature. The character of the nervous symptoms eliminates rabies and pseudorabies. This leaves two diseases that resemble Buss encephalitis: malignant catarrhal fever and listerellosis. In catarrhal fever, the animals are extremely ill from the start. They suddenly cease to eat and become rapidly emaciated. There is also an inflammation of some of the mucous surfaces which is manifest as a very severe diarrhea or a head catarrh or both. This symptom is sufficient for a differential diagnosis. Listerellosis presents a more difficult problem. The symptoms and course of listerellosis may be identical with those of Buss encephalitis. On post-mortem examination, however, a fibrinous peritonitis is usually present in Buss encephalitis while, as a rule, no significant gross lesions are observed in listerellosis. In fact, a certain diagnosis of listerellosis is usually made only from cultures. Attempts to treat Buss encephalitis have not altered the course of the disease. Attempts to prevent the disease after inoculation have also failed.

■ Although the disease described herein appears to be one not previously described, the author does not wish to give the impression that this is in any way certain. When Buss encephalitis was first observed, it was thought that the disease might be an atypical form of malignant catarrhal fever. However, unlike this disease, catarrhal fever is artificially transmitted to cattle with difficulty and perhaps not at all to other species. The incubation period is much longer, all ages may be affected and the mucous but not the serous membranes are affected. The character of the peritonitis and pleurisy observed in Buss encephalitis is similar to that caused by bacteria. A peritonitis much like it has been observed in listerellosis of rabbits (Murray, Webb and Swann[1]), but not in cattle. The symptoms of the disease and its behavior in herds of cattle are also similar to Listerella infection. Its manner of spread is obscure, as is true of listerellosis. Buss encephalitis may be easily transmitted to other species. These and many other features are seen in Listerella infection. It differs from listerellosis in that peritonitis is a constant lesion; no bacteria have been obtained even though several hundred tubes of culture media have been inoculated, and cattle are easily infected artificially which is not the case with Listerella (Schwarte and Biester[2]). Aside from those mentioned above, other forms of encephalitis including turning sickness[3], sporadic encephalitis of cows[4], and bovine encephalitis[5] have been reported. These seem to be widely separated from the Buss type.

In conclusion, it may be said that while it now appears that the encephalitis herein described is a new disease of young cattle, a final decision must await a more thorough study and a close comparison of it with all known forms. Work upon the infection is being continued actively, and a special effort is being made to classify it as one of those diseases already reported, especially listerellosis.

[1] Murray, E. G., R. A. Webb and M. R. R. Swann, 1926. *Jour. Path. and Bact.* 29, pp. 407-439.
[2] Schwarte, L. H. and H. E. Biester, Unpublished data on bovine Listerella infection.
[3] Mettam, R. W. M., and J. Carmichael, 1936. *Parasitology* 28, pp. 254-283.
[4] Jones, F. S. and R. B. Little, 1934. *Arch. Path.* 18, pp. 580-581.
[5] Escalona, J. and F. Camargo, 1936. *J. A. V. M. A.* 88, pp. 81-83.

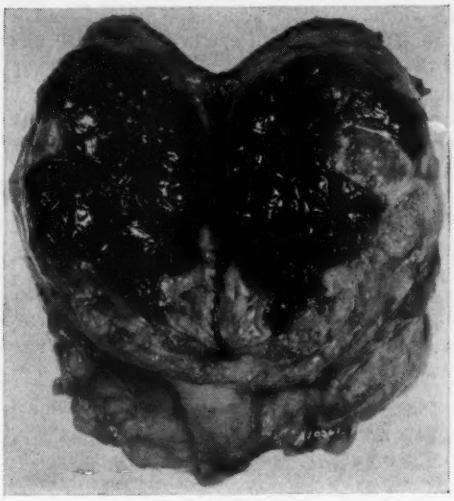
Hematoma in the Testicle of a Bull

A two-year-old purebred Hereford bull was presented at the veterinary clinic of Kansas State College for treatment. He had been purchased recently and put into a large corral with several other young bulls, until the owner noticed a swelling of the scrotum. Because of the sudden appearance of the swelling, the owner thought it to be a rupture; at the clinic, however, a diagnosis of orchitis or periorchitis was made.

The scrotum was warm and sensitive, particularly on the left side. The swelling, involving both sides and particularly the base of the scrotum, was uniformly tense, with no soft spots nor hard masses. The animal showed no pain except on manipulation of the scrotum. The temperature was normal and remained so. A serum agglutination test for brucella organisms was negative.

An attempt was made to reduce the swelling by the application of hot packs, using a heat lamp and hot water, followed by a thorough massage with stainless iodine ointment. This treatment was carried out for about three-quarters of an hour each day. After the sixth day, hot antiphlogistine packs were used. The inflammatory swelling disappeared from the right half of the scrotum at the end of the first three days, but on the left the swelling receded only slightly, and the testicle could not be moved in the scrotum. After 12 days it was decided that further treatment was useless. The owner gave permission to have the testicle removed.

Anesthesia for the operation was obtained by injecting a 2% solution of procaine in the subcutaneous tissue along the proposed line of incision. The incision was made through the scrotum over the anterior surface of the testicle, extending from the rudimentary teats to the bottom of the scrotum. The rather extensive adhesions between the tunica and the scrotum were broken down by blunt dissection, until the testicle was freed from the scrotum and the healthy portion of the cord reached. The testicle was then removed with a emasculator applied above the affected tissue. The wound was treated as an open wound, and healed uneventfully.



The involved testicle incised to show the large blood clot.

The diseased testicle weighed about 1,100gm (the average is about 300gm). Upon making a longitudinal section a large blood clot was found, as shown in the illustration. Histological studies revealed a hematoma, with fibrous proliferation in the epididymis and testicular tissue. It appeared that the hematoma had been caused by mechanical injury and that infection had not occurred before or during the prolonged treatment.

Unless further complications develop, it may be possible to use the bull for breeding. This of course depends largely upon whether the vas deferens was sufficiently involved in the original inflammation to close it. The right testicle and epididymis seemed not to be affected by the removal of the left gonad; at least they did not swell following the operation.

WILLIAM E. SMITH, K.S.C. '40.
Manhattan, Kans.

Practical Suggestions For the Dairy Practitioner*

INTRAVENOUS injections of sodium iodide for the treatment of actinomycosis (bone form) of cattle usually fail, but if the animal has ringworm, they clear that up in a hurry. The fact is, this is the right treatment for ringworm whether the animal has actinomycosis or not. Dissolve three ounces of sodium iodide in 500cc of water and give according to the size, but not more than 50cc to animals less than a year old; about 100cc to 1,000-lb. animals.

Nine times out of ten all that is required to remove a piece of chaff from a cow's eye is a few drops of hydrogen peroxide. The chaff just boils up and floats out.

Place small rubber bands tightly around supernumerary teats to remove them. Do this before the heifer is 1½ years old.

To succeed, a dairyman must raise calves, good ones, better bred than his cows and he cannot do it if he lets them suffer from white scours. A blood transfusion from the dam and no other animal, is the right treatment and practically a certain preventive in calves less than a week of age. If you have difficulty getting the blood into the jugular vein of the calf, just put it under the skin in two or three places.

In some herds, calf pneumonia is a regular source of annoyance and loss. In such herds, every calf should receive 5cc of hemorrhagic septicemia aggression on the day it is dropped, and every three months thereafter until it is a year old.

Dairy practitioners can help their clients a lot by telling them where to get cows and where to sell them. If a man has cows to sell, his veterinarian is likely to know it and he is about first to hear about it when a client wants to buy a cow. Bringing the seller and buyer together helps both.

Cows waste a lot of first cutting alfalfa, by not eating the stems. If this alfalfa is put into the silo they eat all of it.

The day will come when milk will be bought on bacteria count and the dairyman producing good milk will be paid a premium. Any commercial dairy can keep its bacteria count always under 10,000 by following the directions of its veterinarian, and some have kept their counts under 2,000 continuously for years at a time. Occasionally a man will be able to keep his average count under 1,000 for as long as a year by simply rejecting milk from a few quarters in which the count is high. A brom thymol test as an indicator, followed immediately by bacteriological examination will enable a dairyman to prevent an increase in his bacteria count by not using milk from quarters infected with staphylococci or streptococci.

There is no connection whatever between Bang's disease and mastitis. If Bang's disease causes a mastitis at all, which is extremely doubtful, it is a mild, non-clinical disease. Mastitis infection reaches the interior of the quarter from the outside, through the teat meatus, not from the inside through the blood stream.

The least mastitis is found in herds that are best cared for. The milker is the key man in mastitis control. A fast milker will have a great deal of mastitis in the cows he milks; a careful milker, very little. The difference is mainly in the amount of stripping and in some degree, in the rough handling. Cows that are machine milked will have more mastitis than those milked by hand by a careful milker. Milking machines are satisfactory for cows with their first and second calves. After the third calf, a cow should be milked by hand.

One client milking about 50 cows with a milking machine rarely got the bonus of ten cents a hundred for clean, low count

*Practical pointers from an address by Dr. C. H. Case, Akron, Ohio, at the 58th Annual Meeting of the Illinois State Veterinary Medical Association, Springfield, Feb. 15-16, 1940.

milk of below 10,000 bacteria. Following my suggestion, his herd was hand-milked for a year by four men; his count was below 10,000 for the entire year (average count for year 5,100), which added one dollar a day to his income.

When there is cowpox in the herd, dip the teats in chlorine solution after milking. Use a chlorine solution with a soda base. Bleaching powder made for laundries and containing 16% chlorine is the best and cheapest source of chlorine. Make this up in a stock solution containing 4% of chlorine and dilute it for use until the chlorine content is 1:1000.

Most of the trichomoniasis in the dairy herds about Akron is due to buying proved bulls. These animals are usually aged and the proved bull project takes no account of the health of the bull. Many of them have been extremely costly to the dairyman by infecting a large number of his cows, particularly the older ones, with trichomoniasis.

A proved bull was bought early in 1937, and 23 valuable cows had been bred before we realized there was trouble. Only two had live calves; the remainder aborted or the uterus was filled with pus. Of the 19 in the herd today, two had normal calves; the other 17 aborted their first calf. The cows were all treated and rebred to the same bull. This time, two of the 19 failed to conceive, but 17 had live, healthy calves. Today, 11 of these are safe in calf for the third time after being bred to the same bull, and from all indications the outcome will be the same as last year. This goes to show that cows develop a tolerance against trichomoniasis. Mucus from the mouth of the calf at birth showed trichomonads in all calves from the 17 that had live calves the second time the cows were bred, showing that they still harbored infection in the uterus. A heifer that had never been bred was bred to the same bull at that time. Swabs from the vagina 12 to 20 days after breeding showed great numbers of trichomonads. The heifer became pregnant, but aborted two and one-half months later.

Like Bangs' disease, where about four out of five cows that abort never abort again, but remain spreaders of the disease, the possibilities of the spread of trichomoniasis from infected cows which are apparently calving normally, are great. If measures to stop the sale of infected cows are not enforced, we will have as much loss from trichomoniasis as from Bang's disease. It is a disease with a high potential for harm.

Dr. C. H. Case of Akron, Ohio, has an arrangement with 46 dairymen in his section, to visit their herds once monthly. The visits are made at the same time and on approximately the same day of the month. At this time, the breeding record of the herd is brought up to date in a book that he carries, in which a page is devoted to each cow. A brom thymol mastitis test of the milk from each quarter is made and if anything abnormal is indicated by the test, a physical examination of the udder is made and a sample of milk taken to the laboratory for a bacteriological examination, the report being rendered to the dairyman within 24 hours.

Doctor Case thinks and the dairymen think that this monthly visit to test for and control Bang's disease is the most profitable service he has been able to render them. It enables them to keep their breeding efficiency up and their bacteriological count down and to correct abuses before damage is irreparable. The herds vary in size from five to 400 head, and some of them do not sell fluid milk, but want the monthly examination and instructions regarding care of the herd because they themselves use the milk and want it safe to drink raw.

Peganum Harmala, a Poisonous Plant in the Southwest

By E. A. MORAN, J. F. COUCH, and A. B. CLAWSON*
Pathological Division, Bureau of Animal Industry

DURING the summer of 1935 information was received from Prof. G. R. Quesenberry, Director of Extension, New Mexico College of Agriculture, that an introduced plant, identified as *Peganum harmala* and known as Syrian rue and African rue, had lately appeared on a certain section of land in New Mexico, had become abundant on that section, and was suspected of causing deaths among cattle. Through the cooperation of Prof. Quesenberry a supply of the plant was obtained from the area, which is near Deming, in southwestern New Mexico, and with it a preliminary investigation was conducted.

The identification of the plant was confirmed by Dr. S. F. Blake, botanist, in the Bureau of Plant Industry. At the time of collection the plants, which are perennials, may grow to a height of three feet and have white flowers, were in seed.

■ Several feedings were made to guinea pigs in December, 1935, with the result that the plant appeared to be definitely toxic. The finely ground seeds when fed at a level of more than 0.16% of the animal's weight at one feeding always killed, and as low as 0.1% at one feeding has produced death. A dosage of 0.13% of finely ground seed fed daily over a period of five days produced sickness every day, soon after the feeding, but no permanent injury. The symptoms in guinea pigs that were made ill by this plant consisted in loss of control of the hind legs and weakness of the muscles of the back. The symptoms manifested themselves within an hour of the feeding; usually coming on rather suddenly and increasing in intensity for about a half hour and lasting for several hours. Ordinarily much shaking of the entire body was evident and a strenuous effort was made to move along the floor when the animal was approached or stimulated. Recovery was gradual, being completed within 12 hours. In advanced stages the pig would fall over on its side. When the stage where the animal fell over on its side and was unable to right itself was reached, it seldom recovered. However, it might live for several hours. No characteristic lesions were found at autopsy.

The young leaves were less toxic than the seed, producing sickness but not death when fed in 1% doses on a basis of air-dried plant. The older leaves produced no effect when fed in the same dose. The symptoms produced were similar to those noted by Neuner[1] and by Fleury[2] who worked with the alkaloids.

Alkaloids extracted from the New Mexico plants were fed to guinea pigs and produced the same symptoms as the seeds.

■ Small feedings of old woody stems, new growth stems, leaves, seeds, and fruits were made to cattle and sheep during the summer of 1936 at the Salina Experiment Station near Salina, Utah. A heifer was fed at one feeding a quantity of the plant, which contained about 10% of seeds, equal on a dry weight basis to 0.31% of her weight. This produced slight symptoms which consisted of drooling and some excitement for nearly a day after the feeding. Several smaller feedings or feedings with smaller percentages of seeds were made to cattle and sheep without observable effect. This corresponds to the work of Black and Parker[3] who made small feedings of whole seeds and vegetative parts of plants to cattle and sheep.

With larger quantities of material fed at

* Mr. Clawson died June 30, 1937.

[1] Neuner, A., 1894-95. *Arch. Exp. Path. Pharm.* 35:69-76.
[2] Fleury, F., 1910-11. Ibid. 64:105-125.
[3] Black, W. L., and K. W. Parker, 1936. N. Mex. Agr. Exp. Sta. Bul. 240.

one time or with quantities of finely ground seed at a level of 0.1% or more of the animal's weight given at one feeding, very different results might have occurred with cattle and sheep.

■ It appears, therefore, that *Peganum harmala* is definitely poisonous and if eaten by live stock may cause losses, especially if its habit of spreading leads to its occupying a larger area of our range; also that it is most harmful early in the season when the leaves are young and again much later when the seeds are mature. These are precisely the seasons when other forage is likely to be scarce.

* * * *

Starlings Injure Cattle

There has been much publicity recently concerning starlings and their injury to cattle in Kansas and states to the south (Oklahoma and Texas especially).

English starlings are stout, metallic purplish colored birds, about the size of blackbirds, with stubby tails and long, sharp, yellow beaks. They were intentionally imported to New York from England in about 1890 to be used in destroying certain worm and insect pests. Since that time they have spread from the eastern states throughout the Middle West and Great Plains area. They are by nature bold and overbearing and in some of the eastern states they have already appropriated the nesting sites of such birds as house wrens, bluebirds, and flickers. Their natural habit is to congregate in flocks around cattle and feed chiefly on worms and insects.

Starlings were first reported attacking cattle in Kansas in 1937 by E. G. Kelly, extension entomologist. He observed them alighting on backs of cattle and feeding on the partially extruding grubs of the ox warble fly *(Hypoderma lineata)*. No similar reports were received during 1938-9, possibly because of the lighter snowfall that year. This winter, the snow which covered the ground from Christmas until early in February, created a food shortage for many

birds, including the starlings, and this has resulted in their feeding on grubs infesting range cattle and picking at any raw sores or scratches with their long, sharp beaks.

A typical case noted was as follows:

About one hundred Hereford and Angus yearling steers were being fitted for market on a farm north of Manhattan, Kansas. These steers were branded in the left gluteal region with an acid brand January 2, 1940. About one week later the owner first noticed the starlings alighting on the backs of the steers and picking at the fresh wounds and scabs. They continued to cause trouble until the week of January 28, when they descended in droves and caused the animals such discomfort that they stampeded from one end of the feed lot to the other. The cattle kept milling around for several days, with the starlings continually annoying them in spite of the efforts of the owner and his two sons armed with rifles.

Early in February the weather moderated and much of the snow melted. This was the end of the immediate trouble, but much damage had been done. Some of the animals had deep, infected wounds as large as a man's hand over the branded area. Others had only superficial erosions, but all showed evidence of pain in the region of the brands. The owner treated all of them with a liberal painting of pine tar disinfectant, which seemed to facilitate healing and may have helped to repel the starlings.

I saw this herd on February 7th. By this time most of the snow was melted and the starlings were very scarce. The wounds had healed considerably, but most of the brands were obliterated.

Reports have been received from Hutchinson, Haven, Sedgwick, Cottonwood Falls, Liberal, Newton and Wichita, Kans.; Oklahoma City, Okla., and many other cities in the southern Great Plains region confirming previous reports of starlings attacking cattle in order to pick out the grubs. In one herd at Newton, Kans. Doctor Kelly states that several cattle suffered broken legs and other injuries in attempts to escape the persistent attacks of the birds. Many of the attacks were independent of warble infestation, though the latter is most often the cause. They may attack any wound or scratch on the backs of animals where the cattle cannot reach the birds to dislodge them. I have seen no reports telling of starlings attacking wounds on live stock other than cattle.

The only practical method of prophylaxis is destruction of the starlings. These birds prefer to roost and nest in barns and other farm buildings. They are bold, but usually become wary when some of the flock are shot. They cannot be poisoned by using poisoned grain; attempts to do this have only resulted in the deaths of the sparrows and meadow larks mingling with the starlings. A burlap cover gives protection to an animal infested with warble grubs or having lesions from other causes, but this method would necessarily be limited to small herds or to those which are confined. One ingenious stockman in Connecticut spread garbage on a snow-covered field, and when the starlings gathered to feed, set off a charge of dynamite, killing the birds.

Apart from the consideration of damage to live stock, most ornithologists view the rapid establishment and propagation of the starling in the United States with some concern. It has already caused a marked reduction in the numbers of certain more desirable species and it can be expected that its existence in Kansas in its present numbers will upset the balance in native bird populations.

NEVILLE L. ASTLE, K.S.C. '40.
Manhattan, Kans.

Phenothiazine a Highly Adaptable Therapeutic Agent

Phenothiazine has long been a source of many important dyes. It is prepared from diphenylamine, a coal tar product, and sulphur. Chemically it is related to sulfanilamide. A few years ago it was discovered in the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture that phenothiazine is highly lethal to some insects and possesses considerable value as an insecticide.[1]

Somewhat later, Dr. Paul D. Harwood and associates found that phenothiazine is very destructive to intestinal roundworms of sheep, including the nodular worm, *Oesophagostomum columbianum*, for which no remedy had been known previously. In addition it is practically harmless to the host, thus constituting an almost ideal anthelmintic for sheep. This important discovery was first announced in this magazine last year.[2,3] At the present time it rates as the best known treatment for stomach worm, hookworm, whipworm, Chabertia and Nematodirus infestation in sheep and the only known effective treatment for nodular worm infestation in this animal. In larger doses, but still with a safety factor of more than four to one, phenothiazine is fairly effective for the removal of Trichostrongylus and Cooperia species. Practically, of the intestinal parasites of sheep, only tapeworms escape destruction by it.

In the removal of ascarids and nodular worms from swine,[4] phenothiazine is only slightly less effective than in sheep; easily standing at the head of the list of anthelmintics for this purpose, and, as with sheep, constituting the only known remedy for the latter.

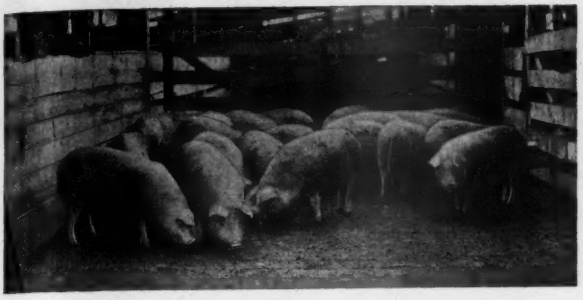
[1] Smith, L. E., 1937. The use of phenothiazine as an insecticide. U. S. Bureau of Entomol. and Pl. Quar. Cir. E-399.

[2] Harwood, Paul D., Robert T. Habermann and A. C. Jerstad, 1939. Efficacy of commercial phenothiazine in the removal of roundworms from sheep. *Vet. Med.* 34:7, pp. 440-443.

[3] Habermann, Robert T. and Paul D. Harwood, 1940. Efficacy of recrystallized phenothiazine for the removal of nematodes from the gastrointestinal tract of sheep. *Vet. Med.* 35:1, pp. 24-29.

[4] Harwood, Paul D., Arthur C. Jerstad and Leonard E. Swanson, 1938. The efficacy of phenothiazine for the removal of ascarids and nodular worms from swine. *Jnl. Parasitol.* 24, suppl. pp. 16-17.

In the removal of strongyles from horses phenothiazine again heads the list of parasiticides in safety and effectiveness. Its relative harmlessness for horses gives promise that it may serve to gradually eliminate the infection from pastures where horses that graze upon them are treated frequently, preventing the deposit of strongyle eggs upon them.



Among the multitude of uses for phenothiazine, its value as a parasiticide in swine and sheep is perhaps the most significant for veterinarians.

Phenothiazine is practically insoluble in the intestinal tract of herbivora. In this fact lies its safety for such animals. However, in the intestinal tract particularly of rats and man some part of it is broken down, absorbed and eliminated in the urine, rendering the latter completely sterile.[5] Thus this agent, an insecticide that because of its nontoxicity does not have to be washed off fruit as do arsenical sprays, a nematocide of the first rank in herbivora, is also a valuable remedy for pyelitis, cystitis and other infections, both acute and chronic, of the urinary tract.

[5] DeEds, Floyd, C. W. Eddy and John O. Thomas, 1938. Studies on phenothiazine V. Fate of phenothiazine in the body.

Even this formidable list does not comprise all the medicinal and botanical uses of phenothiazine. As a dusting powder it is effective (although less so than diphenylamine) against screwworm larvae and bluebottle fly maggots in infected wounds and exposed to direct sunlight it undergoes chemical changes and becomes fungicide. Thus, where heretofore two kinds of sprays have been necessary for fruit orchards—one against insects and another against fungus diseases—a spray of phenothiazine may do the work of both, just as against intestinal parasites it supplants copper sulphate and nicotine for stomach worms, and tetrachlorethylene and chenopodium for parasites of the small and large intestine, in each case doing a better job with less work. Of less importance it is a mosquito larvacide useful to sprinkle on gold fish ponds and will kill horn-fly larvae that hatch in cattle manure if fed to the animals often enough to keep their feces impregnated with it.

Phenothiazine is not yet available commercially, but as soon as manufacturers make suitable application to the Secretary of the U. S. Department of Agriculture it will be released as a medicine and available from veterinary supply sources. It is expected this will be in the near future and as its ingredients are both plentiful and cheap, the price will probably be low.

Observations on Bang's Disease*

The mouth is the most important portal of entry for brucella infection.

Brucella organisms are quite resistant to their environment. They may live for two months in wet soil, four months in feces and 77 days in putrefying organic material. They succumb in a short period if exposed to direct sunlight or to a temperature above 130°F.

Bang's disease agglutinins may appear in the blood of an animal as early as two weeks after infection, or they may not appear until four months after exposure.

On the average, probably not more than 30% of the cows that give a positive reaction to the agglutination test for Bang's disease abort, but the number that abort is extremely variable in different herds.

In a large herd of dairy cattle in Michigan kept under continuous observation for a period of 19 years, the following was noted as to the behavior of Bang's disease over that long period:

Six per cent of the animals that developed a positive reaction did not conceive. Of the reacting animals, 67% aborted at some time. Of those that did abort, 64% aborted only once, and 28% of them became sterile. Eighty-seven per cent of the one time aborters remained positive to the test for life. A cow or heifer that developed the infection (positive reaction) while open, rarely aborted. Twenty-three per cent of the aborters aborted twice, and one-third of them became sterile after the second abortion; 5% aborted three times, 5% aborted four times and 2% aborted five times or more.

The most frequent conditions caused by the Bang bacillus are—acute to chronic placentitis, chorionitis, endometritis, fetal pneumonia, and fetal septicemia and mastitis.

Sterility may result from an endometritis due to infection acquired prior to service but more frequently is due to the persistence of an endometritis developing during pregnancy.

The form of mastitis caused by Bang's bacillus is a rather mild type, usually not detectable by clinical examination, but since it is persistent and progressive it is a cause of serious economic loss due to lowered milk production.

*Excerpts from an address by Dr. E. T. Hallman, East Lansing, Michigan, at the 16th Annual Short Course for Graduate Veterinarians, College of Agriculture, University of Missouri, Columbia, Jan. 31, Feb. 1-2, 1940.

* * * * *

Lymphatic Leucemia Involving the Eye

A HEREFORD steer, approximately one year of age, was brought into the veterinary clinic of Kansas State College, October 10, 1939, with a bilateral panophthalmia and growths involving both eyeballs.

The following history was obtained: The preceding week the owner had noticed a small lump on the left eye, which became larger rapidly and had reached a diameter of five inches. It bore no resemblance to the normal organ, but was merely a large, ulcerative, bleeding mass of tissue. There was also a noticeable lump on the anterior aspect of the right eye.

Examination revealed, in addition to the enlargements on the eyes, an infiltration of lymphoid tissue into the lacrymal gland with adhesions to the eyeball; generalized enlargement of all palpable lymph glands and an increased temperature which during the next week varied from 104.0° F. to 105.8° F.

Blood counts were made for a period of several days; the results are tabulated in Table I.

Extirpation of the left eye was resorted to and the steer was given iron cacodylate to counteract the anemia. Organic iodine (in the form of orgadine) was given experimentally with the hope of diminishing the increasing number of lymphocytes. The animal was treated as follows:

10/11/39—One dram organic iodine (orgadine), in one pint of distilled water; 1½ oz. ferro-Vitamin B compound in one gallon of water, *via* stomach tube.

10/13/39—One pint normal bovine serum intravenously.

10/14/39—One dram organic iodine in one pint of water *via* the stomach tube.

10/16/39—Iron cacodylate, 100gr intravenously.

10/17/39—Iron cacodylate, 100gr intravenously; organic iodine, one dram in one pint of water *via* stomach tube.

lesions in the abomasum, an abcess in the region of the soft palate between the retropharyngeal lymph glands, and a marked edema of the head and neck. The lungs were slightly congested. The right eye showed a corneal ulcer. Microscopic sections of the lacrymal gland and right eye

TABLE I.

Date	10/10/39	10/13/39	10/14/39	10/16/39	10/18/39	10/19/39
			Total Cell Count			
R. B. C.	1,012,500	1,462,500	2,327,500	1,662,500	2,175,000	1,350,000
W. B. C.	38,000	49,000	74,700	41,125	15,400	21,400
Hb. (gm/100cc)	Below 7.5	Below 7.5	Below 7.5	Below 7.5	Below 7.5	Below 7.5
			Differential Cell Count			
Eosinophiles	0	0	0	1	0	0
Basophiles	0	0	0	0	0	0
Myelocytes	0	0	0	1	0	0
Juveniles	0	0	0	0	0	1
Stab forms	0	1	1	0	0	4
Segmenters	0	0	0	0	0	2
Lymphocytes						
Large	11	0	2	4	4	1
Atypical	68	84	94	186	190	171
Small	18	14	3	7	5	13
Monocytes	2	1	0	1	1	8
Blast forms	1	0	0	0	0	0

As shown in Table I, the blood picture indicated a slight rise in the R. B. C. count, October 13th, accompanied by a tremendous increase in lymphocytes, especially the immature lymphoblast forms. Almost the same effect was noted following each administration of iron cacodylate. Although the animal showed a lowered lymphocyte count, euthanasia was performed, since marked weakness and cachexia were evident, and the steer was moribund.

Post-mortem examination revealed bilateral enlargement of all the lymph nodes with the following measurements: right prescapular, 15cm by 6cm; right submaxillary, 13cm by 6cm; left submaxillary, 14cm by 5cm; right parotid, 13cm by 7cm; right retropharyngeal, 10cm by 6.5 cm; left retropharyngeal, 10cm by 5cm; right precrural, 11cm by 5 cm; left bronchial, 15cm by 6.5cm; sublumbar, 13cm by 7.5cm; spleen, 36cm by 12cm by 4 cm; tumorous mass from the right eye, 8cm by 6cm.

Minute metastatic foci were present in the liver, which was swollen, with rounded edges. The spleen appeared normal. There were increased amounts of lymphoid tissue along the proximal portions of the ventricles, the valves were thickened, and the heart muscle was pale. There were no revealed marked lymphocytic infiltration into the glandular and periorbital tissues, as well as in the edematous tissues.

Diagnosis.—Lymphatic leucemia. According to Feldman, this disease in animals is a definite neoplastic disturbance of the blood-forming tissues; it is a malignant hyperplasia of which the immature lymphocyte or its forerunner is the typical cell. He states that if all cases are considered, the lymphoblastomas probably occur with greater frequency than any of the other neoplasms which affect domestic animals, and that without question they are the most common in the human species.

The causative agent of lymphatic leucemia has not been determined, but it is thought by some authorities to be of toxic-infectious origin, perhaps a filterable virus as in the leucemia of poultry; others regard it as upset of endocrine function. In this case the picture was somewhat complicated by the presence of the abcess in the pharyngeal region.

MARK L. GREENBERG and
MORGAN K. JARVIS,* K.S.C. '40
Manhattan, Kans.

*The authors wish to acknowledge the assistance received from Dr. W. W. Thompson in the pathological phase of this work.

Some Quittors Are Inoperable

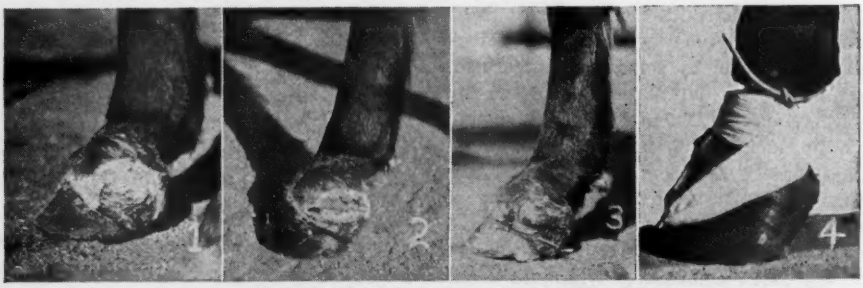
IN country practice today, nearly all quittors that we see are caused by bad barbed wire cuts. There is usually a large area of the lateral cartilage necrosed. The capsule of the distal phalangeal joint, which is attached to the center of the anterior part of the cartilage, pouches outward against the cartilage during flexion; therefore the foot should be kept extended during the operation. Quittor as we see it is a chronic condition with the formation of fistulous tracts, sinuses and progressive necrosis of the cartilage and considerable swelling on the coronet. When drainage through the fistulous tracts is fully established the pain and lameness subside and the case appears to the owner to be on the mend. However, other abscesses soon develop, usually anterior to those already formed, until the entire cartilage is destroyed. The posterior part of the cartilage being surrounded by spongy tissue, the pain and lameness are not so severe as when the disease affects the anterior part, where the parts are confined between the os pedis and the hoof, and severe pressure ensues from even a slight swelling.

The collateral ligaments are short, strong bands which are attached in depressions of the second phalanx. This ligament is wider below and is inserted in a depression just lateral to the extensor process of the third phalanx and here it is mostly anterior to the lateral cartilage. The small blood supply and the feeble power of regeneration of the lateral cartilage limit the reparative processes and usually result in progressive necrosis when infection occurs.

November 16, 1939, I operated on a brown, four-year-old colt which had received a bad wire cut on July 10th. The owner stated that the cut was deep, extending from the central sulcis of the frog obliquely upward and forward on the outside of the hind foot. Apparently it went through the lateral cartilage about the center of the posterior third. The owner had treated it himself. He said that occasionally the colt was very lame, being disinclined to use the leg and lying down a great deal, but after one or more abscesses broke, the animal was so much better that he thought the condition was going to clear up. It persisted, however, and the colt was brought to me for treatment November 15th.

Symptoms.—There was a diffuse swelling of the coronet lateral and anterior just above the hoof with two fistulous tracts discharging a reddish-tinged pus exactly in the center anteriorly just above the coronary band. Probing revealed the area to be honeycombed with fistulous tracts, sinuses, and new cicatricial tissue. The wall of the hoof was slightly bulged outward, but the swelling on the coronet protruded beyond the wall of the hoof.

Operation.—Removal of the lateral cartilage was advised. The foot was somewhat painful, since the condition was located so far anteriorly, but the fistulas were dis-



A typical case of quittor. Fig. 1. Old wire cut and quittor. Fig. 2. Same foot ten days after it was operated upon; the wound is well filled with granulations. Fig. 3. Same, three weeks after the operation; no further dressing required. Fig. 4. Quittor bandage; several more turns will be taken after the tourniquet is removed. —*Photos by Fowler.*

charging freely and it was considered that the condition was not in the acute stage.

The operation was performed the following day. The technique used was that of Perrier as described by Fowler:[1]

The hair from the coronary band to the fetlock should be clipped and preferably shaved. The hoof is thoroughly cleaned of all dirt and scrubbed with a brush and mercury bichloride 1-1000. A pack of cotton is then placed all around the foot, including the sole, and held in place with muslin bandages. This pack is kept soaked with mercury bichloride 1-1000 for 48 hours. A quart of the solution and a rubber syringe are given to the owner with instructions to keep the pack moist by applying some of the solution to the top of the pack every few hours. The purpose of this is to eliminate as far as possible any pathogenic organisms around the site of operation. If this is not done a widespread septic inflammation of the soft tissues around the coronary region may follow the operation.

The horse is given one to two ounces of chloral hydrate in two quarts of water *via* the stomach tube. He is cast with the quittor upwards, and the leg is bound by sash cord or web straps to a long piece of two-by-four or two-by-six board placed under the leg as far as the body, and extending several feet beyond the foot. The outer end may be held by an assistant, thus securely controlling movement of the foot. The digital nerve is blocked with 2% procaine over the fetlock, where it can be palpated underneath the skin. Tincture of iodine is applied to the coronary region and a tourniquet applied tightly around the pastern. Sometimes where there is extensive scar formation of the old wire cut, the tourniquet has to be applied above the fetlock, but it is more effective in controlling hemorrhage if it can be placed below.

For making the incision, I intended to use the technique described by Hutton:[2]

The operation of choice where the deformity is not too great is called the "French operation." It consists in making an incision over the upper border of the lateral cartilage, extending from just in front of the anterior margin to just behind the posterior border. The incision is carried down the inner face of the cartilage to a level with the coronary band. A horizontal incision is then made at the level of the coronary band to meet the first incision and the excised tissue removed by curetting. This operation is more simple than the Bayer or Williams operation and incapacitates the horse during a convalescence only about one-third as long.

In the simplified quittor operation all authors recommend extending the foot to avoid perforating the joint capsule of the coffin joint. I used a twitch with a large loop applied above the fetlock; the rope was twisted above the fetlock and the handle of the twitch placed on the sole of the hoof from behind forward with the rope behind the pastern. An assistant applied strong, steady pressure to the handle of the twitch in an endeavor to extend the foot, but with no success. Hutton's teaching that the incision should be made from above to the medial face of the cartilage was therefore not carried out, since when the foot could not be extended, the hazard of incising the joint capsule of the coffin joint seemed too great.

The posterior part of the cartilage had already ossified. Some of the anterior part seemed to be gone, but the remainder, which was of the color of green pea soup, was removed piecemeal with the curette. (The scalpel was used little in this operation.) After some cartilage had been removed, the joint capsule appeared in the foreground behind the collateral ligament. It was extremely difficult to follow the diseased cartilage about ¾ inch below the coronary band within the hoof with the joint capsule invading the surgical area. The area of bulging was about the size of a hazelnut. Finally the closed Merillat vulsellum forceps was used to keep the joint capsule from bulging over the surgical area, but this interfered somewhat with the operation.

Outcome.—Because the operation was necessarily incomplete, an unfavorable prognosis was given, and the aftercare was left to the owner. Somewhat to my surprise, the colt when seen about a week later had improved considerably; the swelling had gone down, the wound was healing nicely, and he was able to walk fairly well; also, he had a good appetite and was putting on flesh. When last seen (early in January) the condition was completely healed and from the appearance

[1] *Vet. Med.* 33:5 (May, 1938), p. 219.
[2] *Vet. Med.* 28:8 (Aug., 1933), p. 328.

will stay healed. However, there is a great enlargement of the coronary band which will no doubt remain. The animal walks fairly sound, except that the hyperplasia produces some mechanical lameness.

From my experience with this one I shall be more cautious with my next case of quittor and decline to operate on it unless the foot can be extended. When the foot cannot be extended the operation is difficult, laborious, and hazardous and, notwithstanding the partial recovery of this animal, I believe the prognosis is generally unfavorable. In other words, the chance of recovery does not justify the expense of the operation and aftercare.

CHARLES H. HAASJES.

Shelby, Mich.

* * * *

Sodium Iodide for Fistula of the Withers

Recent experience with sodium iodide indicates rather definitely that it is a very effective agent in handling fistula of the withers and poll evil in horses. Of 20 cases treated during the past two years, all showed improvement. Over 50% recovered fully and have remained so to date. Most of the animals were useless to the owner and were treated without charge, as an experiment. To get a more accurate value of the drug, no surgery or local treatment of any kind was used, nor was any change made in the ration.

The procedure was to inject into the jugular vein one to two ounces of sodium iodide in 500cc of water every week until four to six injections had been made. Further injections were less frequent, and depended upon the results obtained.

The use of iodides in the feed, minor surgery, autogenous vaccines and high protein ration are of course indicated along with this treatment in practice. If the patient be a reactor to Bang's disease, frequent injections of live culture vaccine are suggested.

C. L. BUTLER.

Easton, Md.

The Care of Instruments

A WORKMAN is seldom much better than his tools. A dull knife indicates a poor surgeon. It is therefore necessary to take proper care of instruments, particularly those with keen edges.

There are two points to bear in mind when sharpening a knife. One is to produce an edge free of serrations. This is accomplished by sliding the knife across the fine side of the sharpening stone with the edge leading, and lifting that edge first. The second is to prevent the knife from becoming wedge-shaped. This will not happen if the whole blade surface is in even wear on the stone. It is easy merely to touch up the edge, but after so shapening a few times, the knife must be discarded for a new one.

■ One of the most cantankerous instruments a veterinarian has is his scissors. Dull scissors cause agony to the patient when used for clipping hair, and in cutting considerable material, they raise blisters on the wielder's palm. There are two essentials for scissors: a keen edge on both blades, and a properly set screw. To sharpen a pair of scissors, open the blades and bring one edge down on a flat stone. If it is a new pair, observe the angle taken when the sharpened edge is fully in contact with the stone. An angle of approximately 15° from the perpendicular with the upright arm results in the most satisfactory edge. Sharpen until the cutting edge is uniformly sharp. Do the same with the other edge. Set the screw so that the two cutting edges slip easily past each other, yet will shear tissue paper. If the scissors catch in spots, inspection usually reveals a nick in the blade.

All instruments joined by screws give trouble at times, becoming rusty or loose. It may be necessary either to tighten or to loosen the screw. In this process, it is essential to avoid stripping the slot on the head of the screw; make sure that the point of the screwdriver has parallel faces, and that the point fits the slot perfectly, with no tendency to jump out. Place the

instrument on a base, so it will not give or turn beneath the screwdriver, and tighten or loosen as necessary.

■ Sharp operating needles result in less trauma and permit a quicker, neater operation. Operating needles have three cutting edges, and these must be sharp along their whole length. not merely at the point. To sharpen a needle, it is easier to place it in a vise, so that both hands are free to guide the stone smoothly back from the point toward the eye. Never sharpen the needle across the long axis, since the fine grooves thus produced may cause considerable injury to tissue. A rounded surface on the stone is easier to use in sharpening the inner edge. Sharpen both sides of the edge on the inner curve. This will at the same time sharpen the lateral edges.

Hypodermic needles can be resharpened, lengthening their period of service considerably. They should be beveled like a new needle, holding that bevel during the sharpening process. Do not press down too hard during the sharpening process, as this causes the formation of metal splinters, which are difficult to remove without injuring the cutting edge or the point. Too blunt a bevel results in a dull point, and too long a bevel produces greater trauma.

■ Hemostats and other instruments with ratchet locks become unserviceable when the ratchet fails to hold. If the ratchet is worn so that the pawl slips off, this condition can be corrected by notching each tooth and sharpening the pawl. If a new instrument, with a good pawl and ratchet, persistently releases, it may be that the handles are out of line, in which case a slight bending of one or both handles may correct the fault.

■ An instrument that has many uses is the ordinary straight razor. Shaving the site of the operation makes possible a more aseptic field, with more rapid healing. But it is necessary to have a sharp razor. In sharpening a razor on a hone, the same rules apply as in sharpening a knife. Always lead the edge across the stone, and roll the razor on the back of the blade to prepare for the return. To produce a keen edge, strop the razor on leather. To prevent nicking the strop, place the razor on the strop, and slide toward the ring with the back of the razor leading. Near the completion of the stroke raise the edge before completely stopping. Roll the blade on the back, bringing the razor edge down to the strop as the razor is on the return stroke. To bring the edge down with the back not in motion on the return may result in nicking as the keen edge strikes the leather.

When an instrument has been used, wash it thoroughly, cleaning away all blood and filth, particularly in the joints, and dry it with some absorbent material. The modern instrument is protected by a plating of the rust-resisting metals, but most of the larger instruments do not have this protection at their joints. A drop of oil on the joint prevents the development of rust and keeps a good instrument serviceable for a long time.

■ An instrument when it is new is a thing of beauty, shiny in its plating of rust-resistant metal. But if left in a corrosive for a short time, it will shine no more. Our most common disinfectant, iodine, tarnishes instruments if allowed to act on them. Bichloride of mercury is a notorious destroyer of finishes. The common chlorine disinfectants attack the finish, and the copper salts are also offenders. These chemicals do their damage when used as disinfectants because instruments are not thoroughly clean. The most practical way to sterilize instruments is by the use of boiling water or steam. A pressure cooker makes a practical autoclave.

A carpenter must have more tools than a saw and hammer. Can a practitioner be successful if his only tools are a pocket knife and a syringe from which the plating has long been worn, and his dental instruments a battered speculum and a worn-out float? Proper instruments are inexpensive, considering the uses to which they can be put. It pays to buy good instruments and treat them well.

GLENN VAN NESS, K.S.C. '40.
Manhattan, Kans.

Cough Therapy

In view of the fact that coughing is purely a symptom, and that the act is often nature's means of clearing the respiratory channels of excessive accumulations of obstructing or harmful materials, the application of drugs to relieve or suppress the coughing act requires careful selection and intelligent administrative procedure. The act itself is violent, forceful expulsion of air from the lungs as the result of reflex stimulation of the respiratory center. Although the irritant producing the reflex is frequently in some part of the respiratory channels from the pharynx to the lungs, there may be reflexes originating in other parts of the body and having no connection with the respiratory channels. All these facts must be considered in dealing with coughing; treatment of the symptom alone will not give permanent relief.

For the purpose of discussion, the coughing phenomenon is presented in five types, consideration of the nature of each of which is helpful in making selection of the drugs to be employed and in deciding upon the administrative method. These types include only those requiring treatment, as coughing ofttimes is so essential for removing respiratory irritants that treatment is not desirable.

■ One type of coughing is characterized by thick, viscid accumulations which cling to the mucosa in such a manner that expulsion is difficult or impossible. The logical treatment of such cases includes those drugs (expectorants) that increase natural secretions, liquefy the accumulations, or both. Among the agents utilized for this purpose are: water, ammonium chloride, potassium iodide, ammonium carbonate, sodium carbonate and sodium citrate. Water, in large quantities orally and in vapor inhalations, is perhaps the most effective. Ammonium chloride in small oral doses followed by plenty of water is also reliable for thinning mucus, increasing secretions, and stimulating activity of the bronchi. Since ammonium chloride has a decided dehydrating effect, the additional water intake is necessary. Potassium iodide is most useful in small doses incorporated in sugar syrup in cases of an asthmatic nature or in non-acute cases exhibiting very viscid accumulations. Because it produces excess hyperemia reflexly, it should be avoided in acute conditions. The carbonates and citrates are preferable in cases associated with hyperacidity and elevation of temperature.

■ A second type of cough is characterized by profuse accumulations in excess of ability of expulsion by the coughing act. The obvious treatment includes reduction of the quantity of the secretions and amplification of the force of the expulsive act. Agents commonly employed in this type of cough are: atropine, aromatic oils, benzoic acid, balsam, and tar. The dose should be small and frequently repeated until relief is obtained. Recent research indicates that a diet rich in vitamins A and D provides an important adjunct to medicinal treatments.

■ Another type of cough is the hangover, or chronic type, which persists to exhaustion of the animal from a continual coughing effort. Treatment is necessarily directed to removal of the lesion by stimulation of the respiratory mucosa and antagonists of the bacterial invaders, Agents usually employed include members of the aromatic oil group, as eucalyptus, creosote, oil of pine, oil of tar and oil of turpentine, and aromatic derivatives, as terpene hydrate and guaiacol. Terpene hydrate in capsule or in elixir is perhaps the best of the aromatic derivatives. Oil of eucalyptus in local spray, local vapor inhalant, or in emulsion for oral dosing is as reliable as any of the aromatic oils. The much-publicized guaiacols are of very doubtful value.

■ A fourth type of cough is exhibited as violent spasms with little, if any, secretions present for expulsion. Treatment is directed to relief of the exhausting spasmodic effort by use of sedatives such as opium, chloroform, and chloral hydrate for their depressing action upon the respira-

tory center, or by the use of demulcents or local anodynes, as cocaine or belladonna.

■ A fifth type of cough is purely reflexive in nature, resulting from disturbances in other parts of the animal body such as irritations of the ear and stomach. Treatment in this type is directed toward relief of the coughing spasms until the primary lesion can be removed. The centrally acting sedatives or local anodynes may be employed.

Recapitulating, coughing is merely a symptom; any logical treatment is purely adjunctive to the primary treatment of the causative lesion, and no permanent relief can be expected unless the primary condition has first consideration.

C. D. FOLSE.

Kansas City, Kans.

* * * *

Avoiding Reactions in Equine Encephalomyelitis Vaccination

As far as can be determined, unfavorable reactions to vaccination are due to one of four causes: (1) lack of aseptic precautions, (2) improper method of injection, (3) anaphylaxis, and (4) difference in type of horses.

The results obtained by a group of Illinois practitioners, using the following procedure, were highly successful.

Individual 10cc vials, metal 10cc syringes, and one-half inch 20-gauge needles were used. A one-half inch 16-gauge needle was employed to fill the syringes from the vial.

Before vaccinating a group of horses, the syringes and needles were boiled and placed in a pan with a strong solution of bichloride of mercury. The vaccine was drawn from the vial with the larger needle; then the 20-gauge needle was placed on the syringe and the air forced out. After each injection, the needles and syringe were washed out with the antiseptic solution.

The point of injection was painted with a solution of two parts of alcohol and one part tincture of iodine. It was found that the best location for the injection was subcutaneously on the middle third of the lateral surface of the neck in the fascia between the splenius and serratus cervicis muscles. The vaccine was injected slowly, and after the injection the area was massaged to aid in distributing the vaccine in the tissues. Both injections can be made on the same side, but as an additional precaution the other side of the neck was used for the second injection.

In 5,600 injections made in this manner, only three small swellings at the site of injection were reported. There were few systemic reactions in the heavier horses; however, in the lighter thoroughbred animals they were more frequent. Several hundred race horses were vaccinated at one of the leading tracks of the country. The day following vaccination, many stood with heads lowered, and stiffness was apparent for several days. In a week they were back to normal; but a week lost in racing sometimes means much.

From the results of these practitioners it is concluded that reactions due to the vaccine itself are usually rare in draft animals. Most of the reactions—abscesses, septicemia, etc.—can be traced to lack of aseptic precautions and poor technique of administration. Even the reactions caused by anaphylaxis or poor condition of the animal may be minimized by taking the proper precautions.

The vaccination of a thoroughbred, however, is another story. In these high-strung animals, the injection of the vaccine causes a reaction of some sort oftener than not. There appears to be a definite need for the adjustment of the dosage for thoroughbred horses.

CHARLES H. SNIDER, K. S. C. '40.

Manhattan, Kans.

* * * *

When tempted to use a leaky syringe we should not overlook the fact that 0.00002cc of virus is sufficient to produce cholera in a susceptible shote. In other words a single cubic centimeter of blood of an animal suffering from hog cholera is capable of causing the disease in 50 thousand animals.

Our Annual Pig Loss Is Too Great

By A. T. KINSLEY, Kansas City, Missouri

THE extent of the loss of pigs is not generally realized, and efforts to prevent this exorbitant waste have been feeble. Probably less than one-half of the pigs farrowed live until they are marketed or matured for breeding purposes; this heavy toll is apparently assumed by the swine producer as one of the routine incidents of his business.

Extent of Losses

Various estimates have been made of the percentage of pig losses, but it is difficult to obtain even an approximate estimate because of the absence of breeding records. It is true that some pure-bred breeders maintain books, but they are frequently incomplete and thus fail to reveal the necessary information. The grade breeder rarely has any breeding records. The assessor's records are not accurate, but they are probably the most reliable information available, since they show the approximate number of brood sows and the number of swine produced annually. From these data can be deduced the average number of pigs produced per sow and this, compared with the average number of pigs farrowed, gives the approximate average percentage of pigs grown to maturity. According to the assessor's records of one of the average swine producing states, some 600,000 brood sows are maintained and approximately 4,700,000 pigs are produced annually. In this particular state, practically all sows produce two litters each year. Each sow in this state would therefore produce a fraction less than eight pigs on an average each year, and less than four pigs on an average each litter. The average number of pigs farrowed is estimated at from eight to ten, or an average of nine. Therefore, the estimated loss of pigs each year is in excess of 50%. The annual loss on some farms where rather complete records are available vary from 20% to 70%. The percentage of loss is larger on those farms where a large number of sows are bred and smaller on those farms where only a few sows are bred.

In other words, about the same number of swine could be produced by one-half of the present number of brood sows if their breeding efficiency were approximately perfect and the pig loss after farrowing were reduced to a minimum. It is obvious that the reduction of 50% of the brood sows would, other things being equal, make swine production much more profitable.

Cause of Pig Losses

There are at least three important factors that should be considered in relation to this problem: breeding, feeding, and sanitation.

Sex hygiene has been given little consideration in swine breeding. The selection, development and care of the breeding animals has been neglected, the breeder apparently preferring to keep twice the number of brood sows necessary to produce the required number of pigs, rather than devoting some time and energy to increasing the breeding efficiency. Some of the breeding problems that should be given

consideration are: proper age of gilts and young boars for mating; number of years that sows and boars can be successfully and economically used for breeding; proper care and feeding of the sow and boar during the breeding season; the frequency of service of a boar to insure the maximum of strong vigorous pigs; isolation of sows showing evidence of genital infection. Failing to observe and enforce these commonsense rules of breeding accounts in a large measure for pigs that are dead at the time of farrowing, weak pigs that die soon after farrowing, runts, and at least some of the losses from abortion.

The feeding of breeding swine is of great importance. A boar cannot be expected to give the maximum service, or even a reliable service, on a starvation diet or a fattening diet. The sow's diet during the gestation period should contain tissue and bone-building elements in sufficient quantity to insure proper development of the fetuses, and her diet after farrowing should be such as to stimulate milk production. Improper diet of the sow is responsible for a considerable percentage of the pigs that die within 10 days after farrowing. Deficiency diseases such as goiter and rickets can be largely prevented by providing the proper diet for the sow, during the period of gestation, and the time that she is suckling her young.

Sanitary surroundings are now recognized by some of the more progressive breeders as a necessary requirement in successful swine breeding. Insanitary surroundings contribute largely to diseases that destroy pigs, and the provision of clean, dry farrowing houses and pens will materially diminish losses.

Scour probably results primarily from a diminished resistance due to improper diet of the sow and secondarily from infection. Generally speaking, the treatment of little pigs affected with scour is of little avail, but the condition can usually be prevented by proper regulation of the sow's diet.

Parasitic disorders in small pigs are rather common. The condition can be prevented by providing clean quarters for farrowing and worming and dipping the sow just prior to the time that she is placed in the farrowing house or pen.

Bull nose usually occurs in pigs that are kept in insanitary quarters. The condition is manifested in the early stages by persistent sneezing and a tendency to root.

Sore mouth in pigs is usually due to infection succeeding an injury. This condition is some times secondary to injuries due to fighting one another. Proper placing of the pigs for nursing at the time of farrowing at least partially overcomes this condition by preventing fighting for a place. Knocking out the so-called black teeth predisposes to this condition rather than preventing it.

Most of the ailments of pigs are preventable to a large degree. VETERINARY MEDICINE will be pleased to answer inquiries relative to swine management, breeding and feeding problems and the prevention and treatment of swine diseases.

Pathology of Rickets in the Fowl

By L. P. DOYLE, Lafayette, Indiana
Department of Veterinary Science
Purdue University

THE accurate diagnosis of rickets in chickens has become of considerable importance, particularly in areas where broiler production is an important industry. The occurrence of several other forms of so-called leg-weakness in chicks sometimes presents a problem in differential diagnosis. In this connection, the increasing prevalence of encephalomyelitis in chicks in some parts of the country is to be particularly noted, since avian encephalomyelitis may cause clinical symptoms which superficially resemble those of rickets.

The essential pathologic changes which occur in rickets render it rather easy to distinguish this disease from other affections by clinical examination alone. The fact that rickets affects the entire skeleton, causing increased pliability of the bones and beak, is an important feature of the disease. This feature of rickets distinguishes it from perosis, nutritional and other paralysis, encephalomyelitis, and tendovaginitis, all of which may cause leg symptoms.

While rickets in fowls is principally a disease of young, rapidly growing birds, it also occasionally becomes serious in laying pullets that are confined indoors for several weeks or months without being supplied sufficient amounts of the antirachitic factor. The pathology of the disease in pullets is essentially the same as in younger birds, except that decalcification may play a part in bringing about the changes in the bones of pullets.

Fig. 1. An enlarged parathyroid gland (1) is shown along the carotid artery, posterior to the thyroid gland (2). The first rib is indicated at (3), and the brachial artery at (4).

Gross Pathology

The gross pathology of rickets in birds is quite obvious, particularly in advanced stages. All the bones are abnormally soft

Fig. 2. A cross section through the thorax of a rachitic chicken, showing distortion of the ribs.

and there may be marked skeletal distortion. Usually there is also distinct knobbing of the ribs. The knobs on the ribs are most distinct at the junction formed by the sternal and vertebral portions of the ribs. Distinct knobs also occur at the proximal ends of the vertebral portions of the ribs. The ribs may show considerable distortion due to bending and spontaneous fractures. The sternum is frequently crooked, and the leg bones may be bent. When the long bones of the legs are cut longitudinally, a distinct osteoid or cartilaginous zone can often be seen in the metaphyseal regions.

Another interesting gross lesion of rickets in the fowl is enlargement of the parathyroid glands. These glands in the bird are much more completely separated from the thyroid glands than they are in mammals. Each gland is located along the carotid artery, posterior to the thyroid gland, and usually consists of two more or less fused portions.

In advanced stages of rickets, atrophic changes may be found in some of the visceral organs. Degenerative nephritis may also occur. These atrophic and degenerative changes, however, cannot be considered as peculiar to rickets.

Microscopic Pathology

Upon microscopic examination of different tissues from rachitic chickens, various types of degenerative changes may be

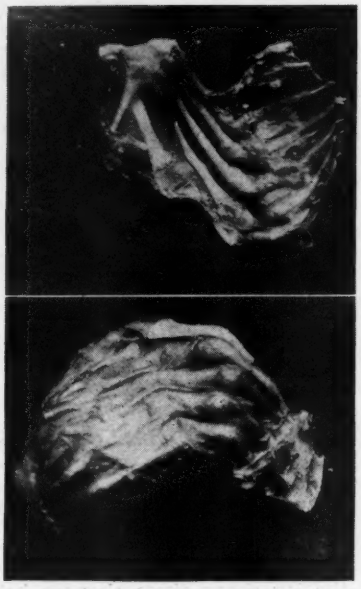


Fig. 3. A portion of the thoracic wall of a rachitic chicken, showing knobbing of the ribs.

found. These are doubtless of only secondary importance. A discussion of the histopathology of avian rickets may properly be limited to the minute changes occurring in the parathyroid glands and in the bones. In the parathyroid glands, the enlargement which is so obvious on gross examination is found to be the result of hyperplasia and hypertrophy of the epithelium. The connective tissue is not disproportionately increased. In some instances there is evidence of degenerative changes in the epithelium. The epithelial cells are sometimes massed in the center of the ascini and are surrounded by vacuolar zones. In other instances the epithelial cells show an apparent dissolution of the cytoplasm and pycnotic nuclei. However,

similar degenerative changes occur in the parathyroids of chickens that are subnormal from causes other than rickets.

In the bones, very definite microscopic changes are found. A longitudinal section

Fig. 4. Photomicrograph of a section from the proximal end of the tibia of a chicken, showing the effects of advanced rickets. The cortex is thickened by osteoid tissue; there is a lack of calcium deposit; the proliferating cartilage shows a marked change of architecture; and the bone marrow is partly replaced by connective tissue.

through the proximal end of a long bone from the leg shows these changes better, perhaps, than any other portion of the skeleton. There is considerable osteoid tissue in the metaphysis; and the cortex of the bone is often thickened by the presence of osteoid tissue. The marrow spaces, particularly near the end of the diaphysis, are usually filled with connective tissue. There is little or no calcium in the zone next to the proliferating cartilage, where calcium should be rather abundant. The proliferating cartilage does not have regular projections extending toward the diaphysis, but either ends abruptly or has irregularly-shaped projections. The cartilage cells in the proliferating cartilage do not have a regular arrangement such as occurs in normal bones. Very often there are islands of cartilage surrounded by osteoid and connective tissue.

It is seen that the pathology of rickets in the fowl is what may reasonably be expected. Since the parathyroid glands are concerned with the metabolism of calcium and phosphorus, conditions which require special effort in metabolizing these elements would be expected to result in hypertrophy of the glands. The increased amount of osteoid and connective tissue in the rachitic bones doubtless represents an effort at compensating for a lack of rigidity.

* * * *

Botulism in Chickens

Case 1

August 11, 1939, a Rhode Island Red pullet was brought to the veterinary hospital of Dr. Thomas P. Crispell, Parsons, Kans., for diagnosis and treatment of a condition involving a number of the flock.

Case 1: Before the flock was treated.

History.—The evening before two of the birds had not gone on the roost as the others did. The next morning, 22 of the birds were on the ground, and appeared to be dead. Closer examination, however, revealed that they were still alive.

Symptoms.—Some of the birds were able to stand on their feet; some sat on the ground with their heads supported by their beaks; some lay at full length with necks flexed at an acute angle, and did not attempt to move. Lethargy, with ptosis of the nictitating membrane and shedding of the feathers over the back were outstanding symptoms. Diarrhea was present in some of the birds, and all showed lassitude and loss of appetite.

Diagnosis.—Botulism.

Treatment.—Treatment consisted of the

Case 1: The flock 72 hours after treatment.

subcutaneous injection of 5cc of polyvalent botulinus antitoxin and the administration of one dram of magnesium sulphate in water with a dose syringe. All the birds received this treatment as soon as they came into the hospital. The next morning five received a second 5cc dose of the antitoxin, and that evening three of those five were given a third dose. Within 72 hours from the first injection, 20 birds had recovered.

Case 2

August 28, 1939, 15 birds from a mixed flock were brought to Doctor Crispell's hospital with the same symptoms described above. Diagnosis: botulism.

Treatment.—Three birds received 5cc of polyvalent botulinus antitoxin (without $MgSO_4$). They recovered completely in 24 hours. The other 12 received 3cc of the antitoxin and one dram of magnesium sulphate in water. Four of these birds died and it was 96 hours before the other eight recovered.

Comment.—Although no material from these birds was sent to the laboratory for confirmation of the clinical diagnosis, it is probable that the diagnosis was correct. It appears that 5cc of the polyvalent botulinus antitoxin and no epsom salts is of greater value than 3cc of the antitoxin plus $MgSO_4$. The earlier the treatment, the lower the mortality rate.

C. H. KENNEDY, K. S. C. '40.
Manhattan, Kans.

Regulations on Imported Animal Byproducts Modified

Although foot-and-mouth disease, rinderpest, and anthrax are distinct contagious diseases of animals, the protective regulations designed to keep the diseases out of the United States have blanketed them under similar regulations. A recent order, No. 371, administered by the Bureau of Animal Industry, U. S. Department of Agriculture and applying principally to hides and skins and other by-products of animals, takes anthrax out of this grouping and relaxes import restrictions where anthrax is the only hazard, but regulates even more strictly certain imports from countries where foot-and-mouth disease or rinderpest exists. Order 371, superseding Order 341, (effective since 1933), went into effect February 1, 1940.

The modification is the result of scientific investigations that indicate that modern methods for control of anthrax have made the disease less of a threat than formerly and that the rigid restrictions that have prevailed on international trade are no longer necessary. At the same time, the spread of foot-and-mouth disease to new territory abroad in the last two years in spite of intensive preventive efforts have made even more obvious the importance of keeping this highly contagious malady out of the United States.

* * * *

Perhaps the most widely traveled hen in the United States is Lady Lime Crest, owned by Limestone Products Corporation of America, Newton, N. J. Lady Lime Crest, whose gizzard was removed at the age of 16 weeks to prove a point in mineral nutrition—that the function of grit in the diet of poultry is to supply minerals, not to grind feed—has used plane, streamlined train, motor bus and automobile in a whirlwind tour of poultry shows and other public appearances. She attended the World's Poultry Congress at Cleveland, Ohio, July 28 to Aug. 7, and New York World's Fair, has appeared in the movies, in radio broadcasts, and in television, and was recently photographed shaking hands with Ex-Governor Harold G. Hoffman of New Jersey.

Fowl Cholera*

By L. D. BUSHNELL, Manhattan, Kansas
Department of Bacteriology
Kansas Agricultural Experiment Station

Introduction

FOWL cholera is an infectious disease affecting a large variety of domesticated and wild birds. It has been reported in chickens, turkeys, pheasants, pigeons, ducks, geese, cage birds and wild birds. The disease is frequently spoken of as a hemorrhagic septicemia because of the widespread distribution of the organisms throughout the body of the infected bird and the common appearance of pinpoint hemorrhages on the various tissues. The use of this term originated with Hueppe in 1896.

Etiology

The etiology of fowl cholera in all birds is the bacterium *Pasteurella avicida*. It occurs as a Gram-negative rod in the blood and tissues and is characterized by bi-polar staining. There are at least three types of the organism as determined by the appearance of the colony on agar plates[1]. These colony types have been described as fluorescent, blue, and intermediate. The fluorescent type is often found associated with severe epizoötics and has a relatively high virulence; the blue type is found associated with enzoötic cholera and is of relatively low virulence and high vegetative capacity. The third colony type, designated intermediate, has proved to be intermediate in virulence and vegetative capacity. It is found in communities where severe epizoötics exist. Under some conditions it resembles the fluorescent form; under others the blue; yet attempts at permanent transformation have not been successful.

Although the characteristic disease is an acute or peracute septicemia with rapid death, there are several chronic forms which are very difficult to recognize in the field. In many instances the organism appears as a secondary invader of lesions primarily caused by some other factor. It is frequently difficult to determine whether it is primary or secondary in such instances.

The relation between the organism of fowl cholera and the other members of the hemorrhagic septicemia group is not known. Most types are named for the species of animal from which they originate and but few successful cross inoculations of different animal species have been recorded. Bacteriologically the organisms are very much alike, no doubt originating from the same strain, and perhaps may revert to the original type.

Distribution

Fowl cholera is of wide distribution and has been reported from every country in which there is an extensive poultry husbandry.

It is probably an ancient disease but the early records are confused since there was no method of making a differential diagnosis until after the investigations of Perroncito[2], Toussaint[3], and Pasteur[4]. At that time cultures were isolated and the disease became recognized as specific and due to the cholera organism.

At the present time the disease appears to be on the decline throughout the world. TeHennepe[5] discussed poultry diseases in the Netherlands and stated that in former years fowl cholera and fowl typhoid were rather prevalent but at present seldom occur. In his data on the prevalence of poultry diseases in that country, cholera was not reported in 1937 and 1938. Bisanti[6] reported a sharp reduction of this disease in Italy, where official reporting of the disease is mandatory. El-Dine[7] stated that fowl cholera has largely disappeared from

*Contribution No. 187, Department of Bacteriology, Kansas Agricultural Experiment Station.

[1] Webster, 1930. *Jour. Exp. Med.*, 51:219.
[2] Perroncito, 1878. Ann. della Acc. di Agric. di Torino, p. 21. Cited by Hadley.
[3] Touissaint, 1879. *Rec. de Med. Vet.* (Alfort), p. 946. Cited by Hadley.
[4] Pasteur, 1880. C. R. Acad. Sci., 91, p. 239.
[5] TeHennepe, 1939. Proc. Seventh World's Poultry Congress, p. 222.
[6] Bisanti, 1939. Proc. Seventh World's Poultry Congress, p. 227.

Egypt. Whenever it is reported the disease appears in an acute form but sometimes takes a severe, peracute course, as a result of which the bird drops dead without showing any symptoms. Some cases may recover if the disease occurs in the chronic form.

Hilbert[8], writing from the Poultry Disease Laboratory, Farmingdale, N. Y., states that the most common loss among ducks in that region is due to cholera. Many outbreaks of the disease in ducks follow adverse weather conditions, insanitary conditions, overcrowding, and poor ventilation. The disease is characterized by sudden deaths and high mortality. In ducks the disease usually is acute but sometimes subacute or chronic.

Sources and Modes of Infection

Experimental transmission of fowl cholera has not been entirely successful because of the fact that there is considerable variation in individual susceptibility of different birds as well as variation in the disease-producing capacity of different cultures. It is recognized that this organism loses its virulence very rapidly in artificial culture. Attempts to increase the virulence by growth on media containing serum or by animal passage have not been very successful. For this reason it has not been possible to develop a standard procedure of study.

It is generally recognized that the severity of the outbreak is associated more directly with the resistance of the host since many organisms of high virulence may be isolated from birds with mild, chronic infections. Virulence is also an important factor, however, and in birds of uniform susceptibility the mortality will be associated with virulence. When strains of relatively low virulence are involved there is a tendency for the infection to become chronic with prolonged sickness, low death rate, and many local lesions.

The number of organisms necessary to establish an infection has never been accurately determined. This is also true of the mode of dissemination through a flock. The results by Hughes and Prickett[12] would indicate that the necessary dosage is relatively large. The highest mortality they obtained was about 50% following the intranasal introduction of a virulent fluorescent strain. (The introduction of the same culture into the intestine did not result in any deaths.) Similar results were obtained with birds five weeks of age and with adult pullets from the same source. These birds were reported to die abruptly of typical cholera or to remain quite healthy. None showed chronic or local forms of the infection. Such results are not quite parallel to those observed in spontaneous outbreaks in the field, where chronic and localized disturbances are not uncommon. As stated by these investigators, the carrier condition may develop and certain birds may harbor the organism in the nasal cleft. It was pointed out, however, that this occurs most frequently with the blue type, the so-called enzoötic form, and rarely with the fluorescent, or epizoötic type of culture.

The individual variation in susceptibility to this infection may lead to different clinical pictures. The most resistant individuals are not infected; those less resistant become carriers; others, more susceptible, contract upper respiratory lesions; while the most susceptible birds die of an acute generalized infection.

The susceptibility is influenced by the season as is shown in the following table.

SEASONAL INCIDENCE OF FOWL CHOLERA IN KANSAS
(PER CENT)

Jan.	Feb.	March	April	May	June
15.1	20.4	17.8	7.1	3.9	1.2
July	Aug.	Sept.	Oct.	Nov.	Dec.
3.9	3.9	3.9	4.7	7.8	10.6

The exact reason for this monthly variation is not known. It cannot be explained entirely on the basis of age susceptibility but is probably due partly to management. It is considerably more prevalent during late winter than at any other time. During the winter months, birds are confined more closely, forced for production, obtain less

[7] El-Dine, 1939. Proc. Seventh World's Poultry Congress, p. 229.
[8] Hilbert, 1939. Proc. Seventh World's Poultry Congress, p. 231.

exercise, and are fed large amounts of a high protein diet. Sanitation is probably an important contributing factor. This is indicated by the fact that since owners have learned to care for their flocks properly, fowl cholera has almost disappeared. Just what importance selection and breeding have had during the past few years cannot be estimated, but they are no doubt an important factor.

The influence of environmental factors on the resistance to infection is generally recognized. Especially such factors as chilling, under-nourishment, insanitary yards, forcing for heavy production, and overcrowding may be predisposing factors. In most instances the correction of these factors is promptly followed by a rapid reduction in mortality. Manninger[9] considers that birds which harbor the fowl cholera bacillus exhibit a tendency to develop the so-called wattle disease following the injection of tuberculin into the wattle. This appears to be subject to seasonal variations, being observed most commonly from October to February. Hoffman[10] studied the etiology of "ruptured yolk" in California flocks and found that 48.2% of the birds exhibiting this condition were infected with *Past. avicida*.

Early investigators considered that the portal of entry of this organism was the gastrointestinal route, but methods of transmission by feeding have been found to be difficult. Later studies have demonstrated that the most likely portal of entry is the upper respiratory tract. This was demonstrated by Hertel[11] and later confirmed by Hughes and his associates.[12]

The organism is easily destroyed by the common disinfectants and by heat. Theoretically it would be rapidly destroyed by direct sunlight.

The following outline summarizes briefly the characteristics of the acute disease and the organisms causing it.

Ante Mortem.—Comb usually purplish. Diarrhea present. Droppings usually yellowish, whitish, mucus-like, or bloody. Death very rapid. Birds found dead without signs of sickness. Prostration very marked. In chronic cases symptoms similar to those of fowl typhoid.

Post Mortem.—Serous and fibrinous exudate less common than in fowl typhoid. Petechial hemorrhages on heart muscle and fat. (Not so prominent in chronic cases.) Liver not usually enlarged, more hemorrhagic and congested, usually friable. Necrotic areas not common. Lungs usually congested and may contain pus. Kidneys, cloudy swelling. Spleen slightly enlarged and congested. Leucemia uncommon, anemia in chronic cases. Intestine shows marked hemorrhagic condition, especially of first flexure. Usually yellowish, mucous, or bloody contents.

Bacteriological.—Many bacteria in blood in acute cases, very few in chronic cases. Gram-negative rods. Polar staining, nonmotile. Mostly uniform in size, 0.5-0.6 by 0.75-1.0 microns. Some young cultures show large, irregular, distorted forms. Grows in scant, somewhat bluish or fluorescent colonies with regular borders. In broth, uniform clouding at first with heavy ring, pellicle, and viscid sediment. Indol positive. Nitrates reduced to nitrites. H_2S rarely produced. Produces acid in glucose and saccharose. Toxin not produced in culture.

Serological. — Organisms agglutinated by homologous serum only in relatively low dilutions. Some strains fix complement with immune serum.

Immunological.—Organisms not phagocyted to any extent, somewhat more in immunized than in non-immunized birds. Rabbits and birds may sometimes be immunized by killed cultures when several doses are used, but not to culture filtrates. They should be considered as having low antigenic value.

Control

The control of fowl cholera is not difficult except perhaps among ducks. From records now available the disease has virtually disappeared in many areas.

Although the organism is widely distributed in nature it shows a tendency to be more prevalent in certain localities. It is possible that it may propagate itself in polluted water and soil. It has been found to remain alive in putrid material for weeks. Although it is sensitive to heat and light it is not injured by cold.

The organisms leave the body in various excretions and remain virulent in the carcasses of dead birds. Contaminated feed and water, contact with carriers, and biting

[9] Manninger, R., 1939. Proc. Seventh World's Poultry Congress, p. 243.
[10] Hoffman, H. A., 1933. *Poultry Science*, 12:189.
[11] Hertel, 1904. Kolle and Wassermann Handbuch. Bd VI. Zweite Autlage, 1913. Cited by Kitt.
[12] Hughes, T. R., and I. W. Prickett, 1930. *Jour Exp. Med.*, 51:239.

insects are important means of starting outbreaks. The disease is frequently introduced into healthy flocks by newly purchased birds. It is likewise possible that wild birds may be vehicles of infection.

When an outbreak appears the healthy stock should be removed to new quarters. It is a common practice to remove the sick birds and allow the healthy birds to remain in the contaminated runs where they will continue to become infected. All visibly sick birds should be killed and burned. In killing sick birds care should be exercised not to contaminate the soil with blood. The neck of the sick bird may be broken without breaking the skin.

Pasteur was the first to use attenuated cultures of the fowl cholera organism for the production of immunity in fowls. Kitt[13] and others were unable to confirm these findings and considered that there was danger of spreading the disease by its use. This investigator then resorted to the use of an immune serum and stated that it had protective value.

Salmon[14] used heated blood for the purpose, while Foa and Bonome[15] used culture filtrates, and Weil[16] used an aggressin prepared from the pleural exudates of rabbits previously inoculated with a virulent culture.

There have been many attempts to use artificial methods for the immunization of birds but none have been successful enough to come into wide use. Phenolized autogenic bacterins were used successfully to control the disease in ducks at Farmingdale, even when the birds were kept under insanitary conditions on the ordinary duck ranch. The bacterins were injected subcutaneously, 1cc being used for ducklings and 2cc for older birds.

Although there is little experimental evidence that bacterins or aggressins are of value in protecting birds against cholera these products are still used in the field with apparently good results.

One point not usually considered by the manufacturers of such products is the fact that the fowl cholera organism varies greatly in its antigenic action. It has been found that the majority of strains are not antigenic at all, or lose this property by cultivation on artificial media. Some cultures dissociate from the S to R form and thus lose their antigenicity and specificity.

A second point which is not considered in field vaccination is that one injection is of little value and may even be harmful. It has been found that the degree of immunity as indicated by serological tests and actual resistance to the injection of virulent cultures is largely parallel to the number of injections. This of course soon reaches the point of diminishing returns as far as the average fowl is concerned. It may be concluded that in general practice the use of bacterins and aggressins is of limited value.

This disease can be controlled most successfully by sanitation and proper management. The feeding utensils must be protected from fecal contamination and the drinking utensils scalded with hot water three times each day. Scalding is more satisfactory than the use of an antiseptic because the former destroys coccidia and worm eggs while the latter does not.

Reducing the protein in the feed appears to be of value in laying flocks. It is also necessary to reduce the total amount of feed during an outbreak. The addition of sour milk appears to be of value because of its flushing effect. Proper protection will also reduce the numbers of birds which develop the infection.

Before adding newly purchased birds or those returned from shows, it is advisable to place them in quarantine for at least two weeks. At the same time two or three of the birds from the flock should be added to the same pens to detect the presence of carriers. The carrier problem is difficult to control. To detect the carriers would require a careful bacteriological examination. Such an examination is suggested only for valuable flocks. When the losses are heavy in less valuable flocks it is best to dispose of all the remaining birds.

[13] Kitt. Th., 1913. Geflügelcholera. Kolle and Wassermann Handbuch, Bd. IV. Zweite Auflagg., p. 37.
[14] Salmon, 1881-'82. Rpt. Com. of Agr., Washington, D. C.
[15] Foa and Bonome, 1888 *Zeit. f. Hyg. und Infektionsk* 5:413.
[16] Weil, 1907. *Zeit. f. Hyg.* 56:509.

A New Technique for Treatment of Fractures of the Mandible in Dogs

By WILLIAM SCHUNICK, D.D.S.,
and
SILAS RICHMAN, D.V.M.[1]
Baltimore, Maryland

A LARGE percentage of fractures of the jaw occur in the mandible. The technique usually employed is the reduction and setting of the fracture through the medium of wiring, followed by immobilization of the jaws. This method, however, has certain disadvantages, namely: (1) The shape and size of the teeth make wiring difficult, since many teeth must be notched in order to hold the wires securely in position. (2) Feeding becomes a problem because of the tendency for the wires to slip from their positions and cut into the soft tissues and gingiva, thereby predisposing the tissues to infection. (3) Pawing at the wires by the patient often disturbs the fracture, thus delaying healing. These disadvantages prompted us to look for a more adequate method for the treatment of fractured jaws.

An alloy (vitallium) successfully used in human surgery for the internal fixation of fractures attracted our attention. At first, we were dubious about the use of an alloy in fracture work, since we knew the many disadvantages connected with the use of metals, such as tissue necrosis, corrosion, bone absorption, loosening of the appliances, and devitalization of tissue. However, vitallium (a strong, hard, light cobalt-chromium-molybdenum alloy) has been found, in an experimental study by Drs. Venable, Stuck, and Beach,[2] to be completely inert and most compatible with living tissue, producing no tissue nor electrolytic reaction, and we determined to use this alloy in developing a more satisfactory technique for setting mandibular fractures.

Vitallium is cast in various shapes and forms (plates, cups, screws, etc.) for use in human surgery. After examining the various types of canine skulls, we designed several plates and screws which could be used for the short, intermediate, and long-nosed breeds of dogs.

Our experimental work, as well as the treatment of several clinical cases of fracture of the mandible, produced results so favorable that we are reporting the technique.

This new method of setting mandibular fractures in dogs represents the first case reported in veterinary literature in which the inert alloy vitallium has been used in animal surgery. The success attained by Drs. Schunick and Richman in their experimental and clinical work with it justifies the trial of this alloy by the veterinarian. Small animals and light horses occur to one as suitable fields in which to test its efficacy.

Diagnosis of Mandibular Fractures

The first step in the diagnosis of mandibular fractures is the examination of the jaws by the use of digital pressure and the intraoral x-ray, wherever possible. The use of digital pressure aids in the location of the fracture, as pressure on the mandible at various points causes pain at the suspected area. In fractures of the symphysis there is no displacement, but by the use of lateral pressure (*i.e.*, by holding one side of the jaw firm and applying pressure on

[1] The authors wish to extend their thanks to Austenal Laboratories of New York for supplying the vitallium plates and screws; and to Drs. E. B. Dibbell and James A. Stewart and Mr. H. Levin for valuable assistance and advice.

[2] Venable, C. S., W. G. Stuck, and A. Beach, 1937. The effects on bone of the presence of metals; based upon electrolysis. Trans. of the So. Surg. Ass. 49, pp. 294-315.

the other) this type of fracture can be determined easily.

Reviewing the symptoms of fracture of

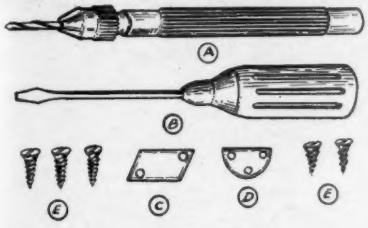


Fig. 1. Instruments for setting fractures with vitallium. A. Pin-chuck and drill. B. Metal screwdriver. C. Vitallium plate for body of mandible. D. Vitallium plate for symphysis of mandible. E. Vitallium screws.

the mandible, we find: (1) there may be deformity caused by the force which produces the fracture or by muscular contraction; (2) there is inability to open or close the jaws; (3) pain is usually severe at the site of the break; (4) swellings may be found due to inflammation or effusion of blood serum into tissue; (5) crepitus may or may not be felt.

Method of Treatment

The general principles of the treatment of fractures are the same, regardless of the position of the bone in the body: reduction of the fracture by bringing the broken surfaces into apposition, fixation of fragments and holding them in proper position until union occurs, and the care of traumatized tissue.

The patient is placed in the recumbent position on the operating table and a general anesthetic is administered. We use nembutal intravenously, watching the pupil of the eye for signs of complete narcosis, rather than depending on dosage according to weight. A more complete oral examination is now possible and any further extent of the injury may be determined.

The instruments used for setting the fracture consist of a pin-chuck, drills the size of the vitallium screws to be used, screw-driver, and vitallium plate (Fig. 1). A scalpel is also necessary in compound fractures where a flap is to be made. These are sterilized, and asepsis is employed throughout the operation to prevent infection being carried into the tissues by the screws.

Setting of a simple fracture of the mandible involves the following steps:

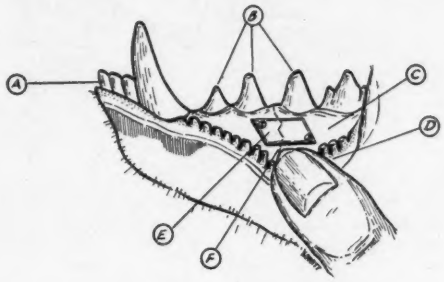


Fig. 2. Simple fracture reduced with vitallium plate and screw in position. A. Incisor teeth. B. Premolars. C. Gingiva. D. Lip retracted. E. Vitallium plate and screw in position. F. Line of fracture.

First Step.—Alcohol and tincture of metaphen are applied to sterilize the field of operation. The location of the vitallium plate in the vestibule of the mouth is determined, the density of bone, position of teeth and roots, nerves, blood vessels, and foramen being taken into consideration. The screws must be placed in such a position that there will be no injury to these underlying structures.

Second Step.—A tap drill of a proper diameter for the screws is employed. This is placed in the pin-chuck and a hole the length of the screw is drilled through mucous membrane, gingiva, periosteum, and bone. The hole is washed with saline solution and the screw placed in position, attaching the plate at one side.

Third Step.—The fracture is reduced and set. A second hole is then made through the plate into the bone and washed with saline solution. The fractured ends of the bone are held firm while the second screw is placed in position. (Care should be taken not to screw the plate too tightly against the tissue.) The area is then painted with alcohol and tincture of metaphen.

Fourth Step.—The plate is allowed to remain in position (Fig. 2) for 15 to 20 days, after which it is removed. The two holes made by the screws repair themselves in the same manner as a tooth socket following extraction.

In the setting of compound fractures, the

technique varies but slightly, since the principle is the same as in setting simple

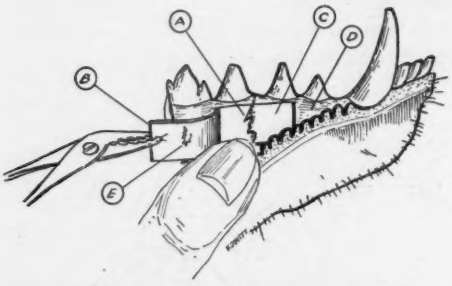


Fig. 3. Flap operation for setting compound fracture of mandible. A. Site of compound fracture. B. Mucoperiosteal flap retracted. C. Periosteum and bone. D. Gingiva. E. Perforation of soft tissue.

fractures. This operation requires flapping of the skin, mucous membrane, and gingiva. The flap is made laterally, exposing both ends of the bone (Fig. 3). Sharp edges of bone are cut off with rongeur forceps and filed smooth with a bone file. Bone fragments and spicules are removed and the area cleansed with normal saline solution. The plate is inserted into the body of one portion of the mandible and the first screw is tapped and screwed directly into the bone. The fracture is reduced and carried into alignment. When the teeth approximate each other and both lateral

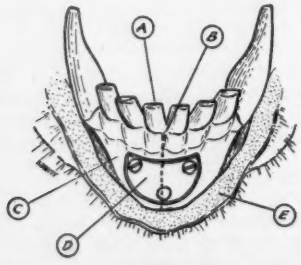


Fig. 5. Reduction of symphysis. A. Incisor teeth. B. Symphysis. C. Gingiva. D. Symphysis plate and screw. E. Mucous membrane.

portions of bone appear equal, the second screw is inserted into the bone by the use of pin-chuck, drill and screw-driver. This plate remains permanently (Fig. 4). The area is painted with antiseptic, over plate and screws, and the flap is returned to its normal position. The gingiva is sutured with No. 5 twisted silk, which is removed in about four days. Healing usually takes place in about 30 days.

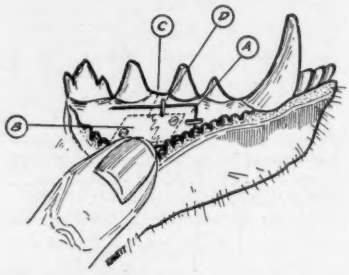


Fig. 4. Compound fracture reduced, plate and screw under gingiva. A. Mucoperiosteal flap in position. B. Plate and screw under gum. C. Fracture reduced. D. Sutures.

In the setting of fractures of the symphysis, the technique employed is the same as that used in simple fractures, with the exception that the vitallium plate has the appearance of a shield and is shaped to conform to the contour of the bone (Fig. 5).

Conclusions

The advantages of this technique are:

1. The difficulties of wiring and accompanying irritation are eliminated.

2. Movement of the jaws may be established very soon after the operation, so that the patient may eat with little difficulty.

3. The plate cannot be pawed out of position.

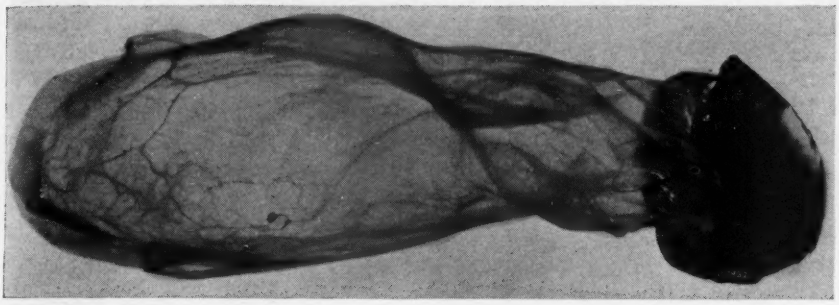
4. It is more sanitary than wires, reducing infection to a minimum.

5. With proper instruments, the technique is very simple.

The disadvantage of this technique is that it cannot be used on young pups, as the screws may injure the permanent tooth buds which are imbedded directly under the deciduous teeth.

Congenital Serous Cyst in a Calf

November 13, 1939, the carcass of a two-month-old Hereford heifer calf was brought to the veterinary clinic of Kansas State College for post-mortem examination. The calf had died that morning following an illness of about four days during which refusal of food and a fetid diarrhea had been the chief symptoms. The most likely cause of death found post-mortem was an acute catarrhal gastroenteritis.



The cyst described in this report. It was 21 inches long and about seven inches in diameter.

During the autopsy the liver was withdrawn, and a large, bladder-like cyst attached to its ventral border was exposed. This cyst was entirely within the serosa of the liver, having no connection with the parenchyma of that organ. It was 21 inches long and about seven inches in diameter, and was filled with a serous, straw-colored fluid resembling lymph. A small amount of fibrinous material was found clinging to the walls and floating in the fluid contents. Microscopic examination of the fluid revealed numerous lymphocytes and a few polymorphs, but no erythrocytes. The specific gravity of the fluid was 1.015.

Congenital serous cysts of the serosa of the liver which usually gives rise to no symptoms are often found in calves. These cavernous lymphangiomas are the only common cystic tumors of the peritoneum; they may be found in any region of the peritoneal cavity. They are usually detected only on post-mortem examination or during operations for other conditions. Whether these tumors are disturbed normal lymph channels or developmental anomalies is not known; however, the latter is considered the more probable by most authorities. The size of this particular cyst in spite of the fact that the calf was only two months old also points in that direction, as does the fact that their appearance and course are similar to those of tumors of other regions which are known to be congenital. Their coincident occurrence with cystic disease of other organs would seem to be a matter of importance from a genetic and surgical standpoint, but this aspect apparently has not been explored, judging by the literature on the subject.

The chief clinical importance of such cysts and tumors lies in their compressing the lumen of adjacent intestines, which may produce symptoms of increasing intestinal obstruction. Treatment for such cases would require surgical intervention. Acute neoplastic invasion of recurrence after removal is said to be uncommon.

Post-mortem inspection of cattle in the packing houses reveals that these abnormalities are seldom found in mature animals. One wonders what becomes of the cyst as the animal ages. Does it disappear in time, or does the calf fail to reach maturity?

ORIN ELLIS, K.S.C. '40.
Manhattan, Kans.

"The Distemper" as Taplin Saw It*

THERE can be no doubt but the inferiority of this subject, to the magnitude of the former [farriery], will prove matter of comment to those whose principal inquiries are directed more to the discovery of defects, than the applause of perfections. These few will, however, bear no proportion to the large body of liberal minded sportsmen to whom it is principally addressed, and for whose use it is almost solely communicated. Nor would it even now have been obtruded, upon public opinion, but at the particular request of gentlemen who, having profited by the instructions, were anxious for the promotion of general utility.

It may, with the strictest justice, be permitted to boast some degree of affinity to the subject [farriery] so largely treated on, when it is considered how very common an appendage one animal [the dog] is to the other [the horse]; so much so, that in field sports their safety and perfections seem not only to go hand in hand, but it is difficult (out of the metropolis) to find the possessor of a horse, or horses, that thinks himself at all equipped without hounds, greyhounds, pointers, spaniels, or terriers, in his train also.

I can hesitate but little in submitting to inspection the observations I have made upon a disease, whose annual destruction is generally known, in every part of the kingdom, with no other description or definition in origin, cause, or effect, than "The Distemper"; of which having endeavored for some years to form an opinion with such accuracy, as predominant symptoms and appearances would permit, I shall transmit them, with the mode of treatment that has hitherto (particularly under my own execution) proved successful, without a single loss, to justify a doubt of the practice when properly persevered in.

■ In my endeavors to form some rational idea of the origin or cause of complaint, I could obtain from others not the least assistance; all the information I could collect (even from the most confident and self-sufficient) was, that "the disorder was in the head, and a green [seton] in the poll in the manner of an issue [discharge of pus], was the only remedy to be relied on." —of this general concise explanation and cure I so far availed myself, as not to omit the inspection of a single subject in my own neighbourhood, where this opinion might be justified or disproved. And I must candidly declare, after months of the strictest attention, I never could perceive a greater proportion than one in ten recover from the supposed effect of this infallible green [seton]; and therefore we may very fairly infer, those that recover under this practice, derive their cure much more from the assistance and efforts of Nature, than from the effect of a remedy so uncertain and inapplicable.

Previous to the more particular description of prevalent symptoms in the animals laboring under the complaint, a few general observations may be introduced without the least digression. I plainly perceived the disease to be much more epidemic than infectious, and that the time of attack varied in the different kinds; but that the ratios of 19 in 20 were affected before they were 12 months old. I observed hounds, greyhounds, pointers, and the larger dogs, were usually attacked between eight and 12 months of age; while spaniels, terriers, and the smaller kinds, suffered between four months and nine. I also remarked the females were in general much less afflicted than the males, many escaping entirely, and those that did not, were neither so severely affected, nor for so great a duration.[1]

Having, about the exact time of forming my predetermined chain of observations, young pointers and spaniels in my possession, upon whose breed I had every reason to fix considerable estimation, they not only soon gave me opportunity to become ex-

* From "The Gentleman's Stable Directory," by William Taplin, 1788.

[1] In this connection see also; Whitney, L. F., 1936, Resistance to Distemper in the Pregnant Bitch, *Vet. Med.* 31:6, pp. 254-8.

ceedingly accurate in my remarks, but to adopt such remedies as I should find most applicable to the symptoms of disease.

■ Of these a pointer, nearly eight months old, was the first attacked. The earliest symptoms of disease were dullness, loathing of food, frequent sickness, and constant vomiting; these producing in a few days great depression and lassitude, were soon followed by perpetual huskiness in the throat, and difficulty of respiration; the nose remarkably dry, and mouth exceedingly hot, with occasional strainings to evacuate by stool without discharge.

Not having been able to reconcile to myself the least prospect of success from the usual operation of "burning a green in the poll with a red hot iron," under an idea of the complaints being in the head, and having from hourly attention, as well as the most accurate observation, every reason to believe the disease particularly affected the throat, stomach, and intestines, it was natural I should advert to such remedies as were more immediately adapted to those parts. My first intent was to promote evacuation, under a perfect conviction there must be a very violent obstruction in the stomach or some part of the intestines; to remove which, I prepared a small ball with a scruple of jalap, four grains of calomel, and two of ginger; forming it into a proper consistence with conserve of hips [rose apples], then covering it with a small portion of fresh butter to facilitate its passage, gave it in that form; there it remained no longer than during its solution in the stomach, almost instantly returning in a state of liquefaction, entirely unaccompanied by any other substance whatever; this I repeated five or six times, in less than three days, with no better success.

As the disease advanced in respect to time, the general symptoms became more violent; the animal, from the first attack, having never taken any food but warm milk (and that in the most trifling quantities), was incredibly emaciated; there was a very great contraction and hollowness of the flank, occasioned by a perceptible stricture of the muscles, that, producing an hourly increasing weakness of the loins, seemed to indicate the approach of inevitable dissolution; the hinder parts had absolutely declined, and could no longer perform their office; when lifted up he could not stand without support, his hind legs sinking under him; and, by the frequent twitchings and convulsive spasms, he seemed encountering the agonies of immediate death.

■ No refinement of thought, no sublimity of expression, is necessary to convey a description of the present dilemma. Every sportsman, whose mind is embellished by the nicer sensations, and whose heart is instinctively open to alleviate the sufferings of these partners of, and contributors to, our pleasures, these nocturnal protectors of our property; as well as the many (though no sportsmen) who have their favorites of the different species, and are no strangers to their attachments, fidelity, and gratitude, have, no doubt, sometime or other, stood in a similar predicament.

Convinced by the state of the extended subject, nothing could be expected but

William Taplin was a remarkably successful writer on veterinary subjects during the last decade of the 18th century, producing 8 volumes between 1789 and 1803. His first work "The Gentleman's Stable Directory", from which this article is excerpted, went through seven editions in the first year after it was published and as many more before the death of the author in 1807. He was born about 1740 and 26 years later began the practice of surgery in London. In 1780 he began to give attention to veterinary medicine and after the age of 45 he devoted his whole time to it. His statements as to his infallible cures should not be censured too severely since it was the custom of medical writers at that time to make such claims.

death, any rational experiment, that could be put into immediate practice, was perfectly justifiable to promote a further investigation of the cause, or very slender and improbable chance of the mitigation or cure of disease. Almost hopeless of even time sufficient to administer the medicine, I prepared a ball, containing three grains of emetic tartar, and ten of jalap, forming the mass and passing it as before. I also incorporated one ounce of the spirit of hartshorn (by frequent shaking) with a quarter of a pint of olive oil, and bathed all the affected parts of the throat, so as to leave the hair underneath the neck plentifully charged with the composition.

For rather more than half an hour, during the solution of the ball, and its consequent effect upon the stomach, the subject seemed to undergo the most painful sensations; agitating vibrations (or tremblings) of the whole frame were very frequent; his eyes, nearly closed, seemed totally fixed, and the foam issuing from both sides of his mouth (as he lay extended at his utmost length), left not the least expectation of ever seeing him even once more upon his legs; when suddenly rising (after repeated efforts) a perfect frame or skeleton, and reeling three or four feet from the carpet he was laid on, threw up (with very little exertion or straining) near half a pint of viscid limpid coagulum, so tenacious and adhesive that there was not the least possibility of partial separation. After this emotion, he could not return to the spot he had arisen from without assistance; to which, being carried and laid down, he appeared somewhat more at ease.

■ Still convinced no satisfactory termination could be obtained, or even expected, without farther exertions, and not entertaining the least doubt, by symptoms before described, but the intestines were equally the seat of disease, and principally concerned in the origin of complaint, without the power of reaching that cause by any other means, I was determined to persevere in my experiments, and proceeded accordingly in the following preparation:

Strong decoction of rue, half a pint;
Lenitive electuary, and common salt, of each a quarter of an ounce;
Olive oil, two tablespoonfuls.

These being properly mixed were administered as a glyster [clyster], of warmth sufficient to stimulate the internal parts to action.

This was however expelled almost instantly upon its injection with great rapidity, as having met some obstacle in its course through the intestine, which served only to excite an unremitting perseverance to obtain relief; particularly as I had sufficient reason to believe, by every look and endeavoring action of the animal, that he had already found some degree of mitigation by the evacuation from his stomach and the relaxation of the intestine. The glyster was repeated in two hours, with almost immediate ejection, producing no other advantage than additional alleviation of predominant symptoms; the subject became evidently more at ease, displaying in his looks certain marks of relief; the stricture upon the abdominal muscles was considerably reduced, and I had little doubt but the state of the stomach and intestines was in some degree altered by the salutary discharge from the former, as well as the good effect and warmth of the internal fomentation upon the other.

Appearances so highly gratifying (and those produced in a few hours by experiments new and uncertain) afforded me the best encouragement to exert every endeavor that could tend to crown the event with success. In about an hour after the last operation, a plate of bread and milk was offered, boiled well together; supporting the head and fore parts from the ground as he lay, in hopes he might be able to take a small portion of nutriment, that would assist exhausted Nature and support the frame; he however, after giving proof of his inclination so to do, failed in the attempt from absolute weakness, and was compelled to decline it.

I was determined that no time, no trouble, on my part should be omitted, and

therefore dedicated the following night to a verification of that excellent motto and

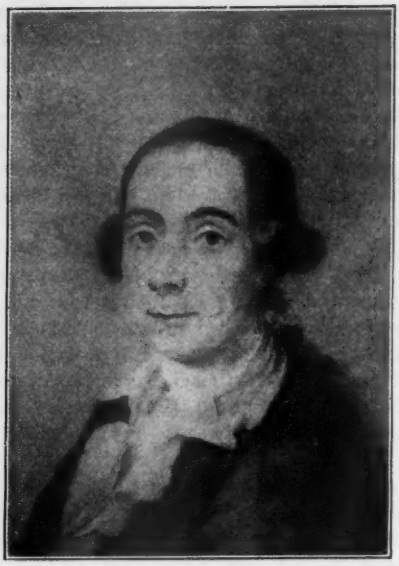
Charles Vial, the French veterinarian who initiated the movement that resulted in the founding of the London [now Royal] Veterinary College, was a contemporary of Taplin's. He arrived in England in 1788—the year in which "The Gentleman's Stable Directory" was published. Vial may be regarded as the founder of the scientific era in English veterinary medicine; Taplin as the exemplar of the preceding era.

excitement to industry, "Persevere and conquer." The subject continued to become much less disquiet, not a symptom but appeared less violent, and he even dozed without extreme pain. In the middle of the night I repeated the glyster, which was then retained a considerable time, and again discharged, as thrown up without the least appearance of, or admixture with, excrement.

After this retention and evacuation of the injection, he tottered, unsupported, to his bed, and lay down evidently better. In less than an hour after this effort and emotion he took, with some degree of eagerness, the bread and milk that had been prepared (previously warmed); about eight in the morning I renewed my injection, which, after being retained for at least ten minutes, came away with a large portion of discoloured crudities, as if brought from the interstices of the intestines by the repeated washings of the injection. This produced additional and very striking advantages: he was seemingly relieved in all respects, the stricture of the muscles upon the intestines, and the contraction of the loins, were both evidently better, and the violence of every former symptom promised gradually to subside; he soon took, and continued to take, occasional supplies of the bread and milk well boiled, of thin consistence, for the purpose.

The glysters were repeated every four or five hours, without remission, with little variation in advantage and appearance, till ten or eleven had been given, their good effects being plainly perceptible in every repetition; when, after a succession of severe trials and repeated strainings for many minutes, one entire mass was voided, composed of every kind of extraneous substance such animal could have been supposed to swallow with food during its puppyism. It clearly consisted of grass or hay, wonderfully matted or interwoven with hair, and particles of sand or gravel cemented together so exceedingly hard, that it might be fairly supposed to have been prepared by art, and passed through a mould by some instrument of powerful pressure.

This extraordinary expulsion occasioned no surprise; on the contrary, it removed every suspense—confirmed every suspicion—and left not one doubt of the cause of complaint or certainty of cure. The animal, almost from this moment, became a new subject, demonstrating in every action, his change of situation; notwithstanding which, the operation, in a few hours, was once more repeated, and in its effect brought away some loose remains exactly corresponding with the substances before described. From this time he suffered no farther inconvenience but what was the result of previous pain, want of nutriment, and bodily debilitation: he continued daily to improve not only in his renewed establishments of health, but, the ensuing season, in his expected qualifications; after which I parted with him, for a very valuable consideration, to a gentleman going to Scotland, who purchased him with an



John Gottlieb Wolstein, another contemporary of Taplin's, was the founder of scientific veterinary medicine in Austria, opening a veterinary school in Vienna in 1777, only 15 years after the founding of the first veterinary college of modern times at Lyon, France.

avowed intent to improve the breed, he being perhaps as fine a figure, with size, bone, speed, and perfection, as ever entered the field.

[The author continues, detailing at great length five more cases quite similar to the foregoing. While one may question if he was dealing with Carré's disease in the first case, at least two of the others were undoubtedly virus canine distemper. All are said to have recovered, except one where directions were not followed.]

■ If I had the least reason to entertain doubts of the success of my endeavors, and earnestly wished another case to establish the point beyond all cause of controversy, such additional proof soon occurred, leaving every instance in favor of the attempt and practice, without a single counteraction to justify a doubt of its consistency.

The constantly increasing claims upon professional attention to objects of greater importance having induced a suspension of the gun, with the disposal of my pointers, an inviolable (or rather invincible) attachment to the species soon procured me an epitome of the fashion, in a brace of terriers; and such being obtained in preference from a palace (rather than the cottage) were equally remarkable for their breed and beauty, soon becoming as pointers had been, objects of adequate attention. Of these the male was attacked under six months old, in every respect as all the others that had been subjects of my observation, and with so much continued severity, and increasing violence of symptoms that I did not entertain either expectation or idea of its recovery. The same plan of operation was pursued as with all the rest, varying the proportions only to age, size, and strength (by reducing the composition of the ball to two grains of emetic tartar, and eight of jalap, and the glysters to half the quantity given to larger dogs), till his recovery was ascertained to a certainty, and he is now in my possession, with the female, that had never been at all attacked, at least to become perceptible. This was the fifth successful trial upon animals under my own inspection, and not to be controverted by the pique or prejudice of those who may conceive the matter too trifling for the press, or the species too insignificant for the process.

Having however (speaking from experimental sensations) every reason to believe there are of all classes great numbers who would most readily encounter not only fatigue, but difficulty and expense, to extricate from disease and threatening death favorites of this species, it is from the flattering hope of their plaudits, that I have gone entirely out of the line of literary ambition, and descended to the descriptive minituæ of a subject that may, from the more sublime and dignified practitioner, undergo every possible accusation of professional degradation, from which I court no exculpation, solicit no acquittal, make no appeal, but to the more decisive and honorable opinion of the sporting world in general, to whose encouraging partiality it is solely addressed, and to whose consideration and particular use it is most respectfully submitted.

Abstracts

Diseases of Fur Animals in Finland

Abortion in fur animals is often due to deficiency diseases.[15] Hairlessness in the young is caused by a vitamin A deficiency, and vesicles on the pads of young animals are considered by some authors to have their origin in what is known as a hemorrhagic diathesis which may be dependent upon nutrition deficiency. The nutrition of fur animals should therefore receive particular attention. Parasitic and infectious diseases are of frequent occurrence, but overfeeding and food poisoning are also common. Paratyphoid is the most prevalent of the infectious diseases. In controlling this disease, hygienic precautions should be taken, but immunization also gives good results. Most loss is due to distemper; no effective means of protection is known. Slaughter of infected animals, strict hygiene, isolation and adequate mineral rations are measures advised. Various antisera have given unsatisfactory results except in mink in which English distemper antiserum has been of considerable value.

* * * *

Infectious Rhinitis of Swine

A careful anatomical, histological and bacteriological examination of the upper respiratory tract was made on groups of healthy and affected pigs.[16] The morbid anatomy and histopathology of infectious rhinitis and influenza are described. It was found that rhinitis leads to chronic changes ending in atrophy of the parts and occlusion of the nasal cavities and sinus. Whereas in healthy stock the ethmoid sinuses and nasopharynx were practically free of bacteria, in 40% of infected animals the influenza bacillus was recovered from these parts. When healthy stock was injected intranasally with secretion from pigs with rhinitis, a bronchopneumonia such as that which occurs in influenza was often induced; conversely, material from lung lesions in influenza cases caused rhinitis. The conclusion drawn is that infectious rhinitis is a chronic form of influenza localized in the upper respiratory tract. [The possibility of the two diseases being present together in the inocula does not appear to have been eliminated.]

* * * *

Meat Inspection in Germany

A comment on recent German regulations concerning meat inspection is followed by a detailed discussion of problems still unsolved.[22] Although the eradication of cysticercosis in swine has been very successful, cysticercosis in cattle is more frequent than ever before. The detection of Taenia carriers in man should be improved by premiums for every whole Taenia delivered, and it should be obligatory for treatment to be under medical supervision, ensuring that the parasites and their eggs are effectively destroyed. The number of Taenia carriers is appalling. Meadows and pastures should not be manured with human feces. [It is not suggested that the custom of eating raw meat should be abandoned.] Echinococcosis has decreased in cattle and swine, but has increased in sheep. The inspection of sheep slaughtered on the farm and the periodical treatment of sheep dogs may lead to a decrease in the incidence of echinococcosis. Similar measures may lead to a complete disappearance of coenurosis.

Trichinosis in foxes seems to be more common than in swine; mice are a possible source of infection. Great losses are caused by confiscation of the meat of cryptorchid pigs because of the odor. All cryptorchids should undergo castration before the age of four months; 11 days after castration the lean meat will be odorless, but the odor takes 10 weeks to disappear from the fat. The finding of vertebral tuberculosis in pigs makes an inspection of other bones necessary, and tuberculosis of one bone justifies a degradation of the meat quality. The

[15] Stenius, P. I., 1939. Sjukdomar i våra pälsdjursgårdar. *Suom. Eläinlääkäril* 45, pp. 23-31. Abst. by R. Stenius in the *Vet. Bul.*, 9:12, pp. 869-870.

[16] Radtke, G., 1938. Untersuchungen über die Ursache und das Wesen der Schnüffelkrankheit des Schweines. *Arch. Wiss. Prakt. Tierheilk.* 72, pp. 371-423. Abst. by P. S. Watts in the *Vet. Bul.*, 9:12, p. 874.

[22] von Ostertag, R., 1938. Neuzeitliche Fragen der Fleischbeschau. *Z. Fleisch-u. Milchhyg.* 49, pp. 1-6, 21-23, 66-67, 81-82, and 101-103. Abst. by V. Chládek in the *Vet. Bul.*, 9:12, p. 889.

tonsils of cattle and swine should always be inspected, but without making incisions, and removed as unfit for food. Attention is called to the spreading of *Brucella melitensis* infection in the eastern part of France.

* * * *

Anaerobes in Bacteriological Meat Inspection

According to German regulations pieces of muscle, spleen, kidney or liver from suspected carcasses are put into dextrose agar or liver-broth media, the presence of anaerobes being judged by the gas formation. The authors [23] investigated carcasses in this way, and in addition differentiated the organisms by Fortner's method. From the 779 carcasses examined, 213 cultures of anaerobes were isolated. Other observations were made to determine the seat of infection, the extent of infection in slaughter animals, and the influence of temperature on the organisms. In descending order of frequency, anaerobes were found in the liver, kidney, spleen and muscles.

Sheep are the most frequently affected, then cattle, calves, horses and pigs. Most of the anaerobic infections were found during July and August.

The anaerobes found are divided into three groups. Pathogenic types were present in 94 out of 213 cases, in which the anaerobes found were *Clostridium welchii* in 64 cases, *Cl. septique* in 21, and *Cl. oedematiens* in nine.

In 119 cases the anaerobes were non-pathogenic. Putrefactive non-pathogenic strains represented by *Cl. sporogenes* and *Cl. bifermentans* were present in 24% of cases in which anaerobes were present. Non-pathogenic, non-putrefactive anaerobes were found in 31% of cases (*Cl. amylobacter, Cl. sphenoides, Cl. multifermentans, Cl. tetanomorphus* and *Cl. lichenoides*).

Anaerobes were found mostly in carcasses in which there were disease of the genital tract of cattle and digestive tract of sheep, but sometimes also in those of cattle in which there was traumatic peritonitis and pericarditis.

The authors suggest that when pathogenic anaerobes are present the carcass is unfit for consumption and should be condemned. The putrefactive non-pathogenic anaerobes produce putrefaction and green discoloration of the tissues and a foul odor, and the keeping quality of the meet is impaired; meat infected with such organisms should be condemned. Non-putrefactive, non-pathogenic anaerobes are the least dangerous, and in this case only the affected part of the carcass should be condemned.

* * * *

Milk-Borne Staphylococcus Poisoning

All outbreaks of milk-borne staphylococcal food poisoning investigated by the authors [21] originated from small herds supplying milk to small communities. In all instances cows with staphylococcal mastitis were found. The affected milk had a normal appearance and taste. That outbreaks did not occur in large cities was probably due to bulking of milk and consequent dilution of the enterotoxin, which is relatively stable to heat and not destroyed by pasteurization.

Symptoms usually appeared two to four hours after consumption of affected milk, and this fact helps to distinguish staphylococcal from salmonella food poisoning, since in the latter the symptoms generally appear not less than six hours, and often as late as 24 hours to 48 hours, after ingestion. An individual immunity or tolerance to the toxin is not uncommon.

The authors state that the most reliable method of detecting food poisoning strains of staphylococci is to culture the organisms, under conditions favorable to the development of the enterotoxin, and then to feed sterile filtrates to human volunteers with due precaution.

[23] Schoop, G., and P. Lorenzen, 1938. Anaerobier in der bakteriologischen Fleischbeschau. 46, pp. 209-215. Abst. by M. F. Benjamin in the *Vet. Bul.*, 9:12, pp. 889-890.

[21] Shaughnessy, H. J., and T. C. Grubb, 1937. The incrimination of milk and milk products in Staphylococcus poisoning. Suggested methods for the investigation of outbreaks. *Canad. Publ. Hlth. Jnl.* 28, pp. 229-234. Abst. by H. E. Bywater in the *Vet. Bul.*, 9:12, pp. 888-889.

Syngamus Pneumonia in Birds

The author[25] found that the larvae of the gapeworm *S. trachea* pass from the intestine to the lungs of the definitive host by way of the blood stream, having been recovered from blood taken from the auricles of the heart and from the posterior vena cava. A description is given of the condition of the heavily infected lungs. A condition of "syngamus pneumonia" has been found to occur in wild state among poults of partridges and pheasants. The parasite is a bloodsucker throughout its life, and must be recognized as of pathogenic importance in both larval and adult stages.

Puppies Develop Muscle Dystrophy from Vitamin E Deficiency

Research at the University of Wisconsin developed the fact that a diet of commercial evaporated milk results in a vitamin E deficiency in dogs, which is manifested by acute muscular dystrophy and other recognized symptoms of vitamin E deficiency in puppies of the second generation. Puppies from normal dams fed evaporated milk from weaning to maturity did not develop vitamin E deficiency except as a result of the strain of pregnancy or lactation, but puppies from mothers so fed early developed muscle dystrophy similar to that which has been reported in rats and guinea pigs. When these puppies were taken from their dam's milk and fed evaporated milk the progress of the ailment was arrested, but they did not recover from the muscular weakness nor did they grow like normal puppies. If fed a vitamin E supplement (5mg of dl-*a*-tocopheral acetate per week) they recovered completely and grew like normal puppies. There were indications that a diet of raw milk results in vitamin E deficiency in the third generation in dogs, thus indicating that it is low in vitamin E before processing and also that the dam on a low vitamin E diet conserves this vitamin at the expense of her offspring.

Sodium Iodide for Actinomycosis

The method of treating actinomycosis described by Farquharson was tested on a series of 16 cases of actinomycosis in cattle.[24] "In actinobacillosis of the tongue the lesions completely resolved after one treatment. Satisfactory results were obtained following the treatment of cases of actinobacillosis of tissues other than the tongue and streptothrix infection of hard and soft tissues. As the number of cases treated was small, it is difficult to assess the results accurately. This is being corrected by further tests in a second series of cases. Two cases of staphylococcal actinomycosis of the udder failed to respond to treatment."

Deterioration of Sheep Dip from Use

Hobson[27] found a marked difference in the protection from myiasis afforded sheep by fresh and used arsenic dip. The lowered effectiveness of the dip as more and more sheep were put through it was not due to a lessened percentage of arsenic in the dip nor to contamination with feces, urine and other filth, but to the solution of suint, a water-soluble substance in sheep's wool which contains a high proportion of fatty acids and markedly lowers the surface tension of water, thus facilitating drainage of the dip from the wool and leaving only about one-third as much arsenic in the wool from the last three of a flock of 264 as was left in the wool of the first three members of the flock dipped in the solution. The remedy is believed to lie in adding to sheep dip something that will neutralize the effect of the suint with which it becomes contaminated from use.

[25] Clapham, P. A., 1939. On the larval migration of *Syngamus trachea* and its causal relationship to pneumonia in young birds. *Jnl. Helminth.* 17:3, pp. 159-162. Abst. in *Exp. Sta. Rec.* 82:2, p. 259.

[26] Anderson, H. D., C. A. Elvehjem and J. E. Couce Jr., 1939. Vitamin E deficiency in dogs. *Proc., Soc. Exp. Biol. & Med.*, 42:3, pp. 750-5.

[24] Pullar, E. M., 1939. The treatment of actinomycosis by the intravenous administration of sodium iodide. *Austral. Vet. Jour.* 15:3, pp. 104-117. Abst. in *Exp. Sta. Rec.* 82:2, p. 254.

[27] Hobson, R. P., 1939. Effect of suint on sheep dips. *Nature*, 144:3661, pp. 1093-4.

Book Reviews

Practical Veterinary Pharmacology, Materia Medica and Therapeutics. *By Howard J. Milks,* Professor of Therapeutics and Director of the Small Animal Clinic, New York State Veterinary College at Cornell University, with a chapter on Biological Therapeutics by *Adolph Eichhorn,* Director of the Animal Disease Station of the Bureau of Animal Industry, U. S. Department of Agriculture. 4th Edition. Cloth bound. 620 pages, 33 illustrations. Alexander Eger, Chicago, 1940. $6.00. (May be ordered through the book department of VETERINARY MEDICINE.)

Howard J. Milks

This revision of Milk's well-known and justly popular text is a welcome one at this time, since additions to the veterinarian's therapeutic armamentarium have been frequent of recent years. The remedial agents discussions of which have been added in this edition include: cevitamic acid, nicotinic acid, nicotinic acid amide, amphetamine sulphate (benzedrine sulphate), borocaine, bulk producers, dihydro-morphinone hydrochloride, eucalyptol, halital, protamine zinc insulin, kephrine hydrochloride, lentin, mandelic acid and the mandelates, meroxyl, ovoflavin and riboflavin, phenolor, prontosil, sulfanilamide, sulfapyridine, propadrine, prostigmine, salyrgan, colloidal sulphur, thiamin, and zephiran. A few prescriptions have been added.

* * * *

A report of the proceedings of the Kansas Veterinary Medical Association at its 35th annual convention in February, 1939, compiled by Chas. W. Bower, has been issued in a booklet of 94 pages. It includes an account of the business transacted at the meeting, the committee reports, the papers read, and a copy of the constitution, by-laws, and code of ethics of the organization.

Fleas of Eastern United States. *By Irving Fox,* Department of Zoölogy and Entomology, Iowa State College. Cloth bound. 191 pages; 168 illustrations (line drawings). Iowa State College Press, Ames, 1940. $3.00.

No one knows how important fleas are as a factor in the cause of distribution of animal diseases. The practitioner of human medicine is on surer ground in appraising the depredations of this pestiferous parasite of mammals and birds, since in addition to the annoyance for which he is solely responsible he has been incriminated surely as a carrier of other infections, the most deadly of which is perhaps bubonic plague, the commonest perhaps endemic typhus.

There are experienced veterinarians that advise "look for the flea" when confronted with almost any type of skin ailment in the dog, and they do so with justification. That fleas are the intermediate host of *Dipylidium caninum* is established; that they contribute to the distribution of other forms of infection is strongly suspected although not proved. Veterinarians cannot know too much about them. The work in hand tells how to know them and where to find them. For remedies the reader must seek elsewhere.

* * * *

How I Toured the World on Nothing. *By Walter Buchler.* Paper bound. 48 pages. Useful Publications, 524 Mansion House Chambers, London, E.C.4, 1939. $1.00 (post free).

The author tells informally of his experiences while touring the world as a free-lance writer and photographer, and gives advice to those who have a yen to do likewise. Several articles on veterinary subjects for which he gathered material while on his tour have appeared in VETERINARY MEDICINE (Veterinary Service in India, 33:1, p. 5; Veterinary Practice in Malta, 33:12, p. 591; The Veterinarian in Cyprus, 35:1, p. 68).